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# the OIL AND GAS JOURNAL

MAY 4, 1959

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SPECIAL REPORT

Arabs want bigger share of profits ▸ 78

No. 4 in a series by the Journal's international editor

What torque on a sucker-rod joint? ▸ 86

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## NEW HF ALKY UNIT POINTS SOME TRENDS

Features aerial cooling, shell-and-tube reactors

p. 82

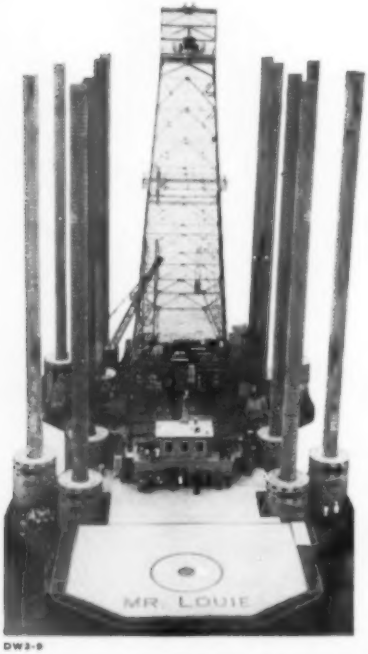
*On 23,400-foot well . . .*

# MID-CONTINENT RIG HANDLED HEAVY LOADS WITH EASE

**23,400 feet drilled . . . 660,000-pound hook loads handled . . . with completely trouble-free drawworks operation! That is the record of the Mid-Continent U-1220-EB Electra-Flow Drawworks on Great Western Drilling Company's Rig 44 in Pecos County, Texas.**

**During the drilling operation, Rig 44 set 15,849 feet of 9⅝" casing—believed to be the longest string of this size ever run. This casing string had an effective weight of 660,000 pounds, a load which the drawworks handled easily, prior to cementing.**

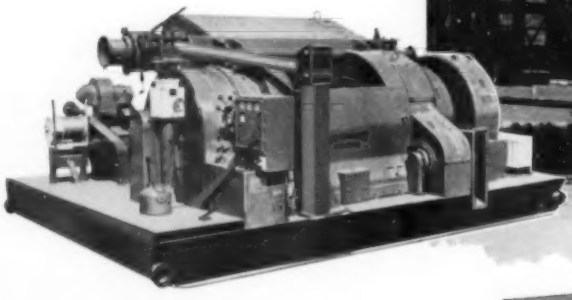
**For complete information about the U-1220-EB . . . or any Mid-Continent drawworks, contact your nearest Mid-Continent representative.**




DW2-9

"MR. LOUIE" FEATURES U-1220-EB

**Also the choice of Universal Drilling Co., a Mid-Continent U-1220-EB Drawworks was selected for their new self-elevated offshore drilling platform "Mr. Louie," recently christened at New Orleans.**



See Mid-Continent's Exhibit at the Tulsa Oil Show, May 14-23

## MID-CONTINENT SUPPLY CO.

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THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
May 4, 1959

Oil has passed the first post on its way to a good year:

First-quarter earnings were good to excellent and in most cases sharply higher than last year.

This brighter performance stems from:

...Jump in sales volume, especially gasoline.

...Stepped up crude and gas production and refinery runs.

...Better profit margins on products.

Oil executives now are telling their stockholders they can expect the first-quarter pace to continue through the year.

If so, it will be a record year for many oil firms (p. 59).

▼ ▼ ▼

Refinery runs are being throttled down nicely.

They eased off 151,000 bbl. daily last week, the third straight weekly decrease. The 7,705,000 bbl. daily run last week is 302,000 bbl. daily lower than at the end of March.

But runs can drop a little more in order to restore better balance to 4-product stocks.

Stocks dropped last week by 1,173,000 bbl., the first good decline this month.

▼ ▼ ▼

Drilling tempo is picking up steadily.

Active rotary rigs now have reached 2,108, and average for the 4 weeks in April was 2,071 compared with 1,808 last year. Average of 17 weekly rig reports this year has been 1,922 rigs working compared with 1,874 for same period last year.

April is first month this year with an average above 2,000 rigs. Last year only 3 months topped the 2,000-rig average. They were January with 2,016, November with 2,107, and December with 2,259.

In Canada, a 7-week skid in rig activity has ended. Total of 127 rigs is now busy, up 18 from week before which was low point of year.

▼ ▼ ▼

American oil equipment makers can expect stiffer competition from the British.

The Council of British Equipment Makers has set up a

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credit organization. Its job is to promote the sale of plant and other equipment overseas on deferred terms.

First pitch was trying to arrange terms for sale of British equipment to Minatitlan refinery in Mexico.

Russian oil men will be absent at the World Petroleum Congress when it opens next month in New York.

Arrangements for Russian scientists to attend the sessions were cancelled last week by Prof. A. V. Topchiev, vice president of the Soviet academy of Science.

Topchiev said discrimination against Russians was reason for the cancellation. He referred to State Department policy not to let Russian scientists visit certain areas in the U. S. unless reciprocal rights were granted to U. S. oil men.

▼ ▼ ▼

Reservoir engineers will be interested in this problem of their colleagues at Sunray Mid-Continent.

Sunray engineers are studying preliminary results of a propane injection project. Their problem is whether to continue the Newhall-Potrero project in California by:

...Carrying it on as a miscible-phase recovery project by expanding the propane slug in place with injected gas.

...Storing summer surplus propane for withdrawals in winter. This also would maintain reservoir pressures.

...Combining the two by adding second injection well, starting gas injection also, and limiting winter propane withdrawals. Enough extra propane probably could be injected with a second well to make it an effective miscible phase project and still allow for enough propane to make winter withdrawals economic.

Injection and backflow rates of propane in the project are encouraging. Producing recovery phase "is not discouraging," Sunray says. But it's still too early to predict success of any one of the three possible new steps.

West Coast production men got an excellent run-down on newest techniques for sand control down hole in a Los Angeles API session last week.

For those who believe it's best to confine sand at the bottom of the hole, choices are:

...Double-wall liners with relatively large slots.

...Walnut shells, graded for size and plastic coated.

...Close-fitting liners of conventional design, run in wells completed with oil-base fluid.

...Wire-wrapped liners in which a wire wrap is placed on slotted or perforated liner.

▼ ▼ ▼

They're still big in Texas:

The Henderson 1 Montrose Unit is rated at 500,000 M.c.f. of gas daily. Well is in the condensate-rich Port Acres field

near Port Arthur and is second largest gas producer for the Texas coast this year. Phillips 1 Prets in Alta Loma area had potential of 850,000 M.c.f. daily.

Fred Turner, Jr. 4 Shannon BB filled tanks at rate of 10,929 bbl. daily after blowing tools part way up the hole when operators drilled into pay. Well is in Southeast Noelke pool, opened by a Turner discovery which went wild at rate of 100,000 bbl. daily. Pay sand is at 1,717 ft.

The Green County play is tapering off and Kentucky independents are looking seriously at other possibilities.

Their attention is going to possibility of oil on the flanks of the great Cincinnati Arch which traverses the state.

The Green County bonanza demonstrates the woeful lack of adequate exploration in Kentucky. It may lead to a more scientific study of Kentucky geology.

The Kentucky story is just another facet of the revived interest in the entire Appalachian region.

A drilling barge will participate in most important scientific project since the satellites.

This is a proposed core hole into the underlayer of the earth's crust. Site will be a half-mile deep "Mohole" in 14,000 ft. of water north of Puerto Rico where cores may be recovered from a zone lying 20 to 30 miles below the surface.

Project also could turn up useful lessons for future deep offshore drilling.

National Academy of Science planners have both confidence and cash for the project. Four survey vessels are setting out this month to spot a location.

▼ ▼ ▼

The gas industry is in better shape than ever to care for its growing list of winter customers.

Total underground-storage capacity for natural gas is now estimated at 2.7 trillion cubic feet—about 9.4% more than last year. Journal survey also shows more than half of this is in working-gas capacity.

At least 18 projects are planned or started as companies continue to spend millions for their winter ace-in-the-hole. These projects have spread to 207 areas in 21 states.

The complete survey will appear in next week's issue.

Tennessee Gas can move quickly on its Midwestern project if FPC approval comes through. Action is expected momentarily on the plan to move more gas into the Chicago area.

Contracts have been awarded on the 350-mile, 30-in. line from Portland, Tenn., to Joliet, Ill., and crews could start work early this month.

Transwestern Pipeline is another firm waiting for the FPC whistle to start laying pipe.

It's already stockpiling pipe for proposed big-inch gas line from Texas Panhandle and lower Permian basin producing areas to California.

More than 100 carloads of pipe have been stored at Fort Stockton, Texas, with more on the way. Pipe also is being unloaded at Pampa and Roswell, N. M.

▼ ▼ ▼

Argentina is asking bids on exploration, development and exploitation rights to zones in 17 provinces.

Maximum size of each zone is 30,000 sq. klm.

Bids will be opened on July 2. All available data on the offer plus terms may be obtained from Argentine Government Oil Fields, a YPF agency, at its offices in Empire State Bldg.

French are busy looking for markets outside France for Hassi Messaoud crude.

They expect to be moving 240,000 bbl. daily from the big Sahara field through a 450-mile pipeline to the Mediterranean by October.

But the light, 44°-gravity oil is not especially suited to the French market which demands heavy fuel oil. The French are hunting exchange deals.

▼ ▼ ▼

West Coast refiners face the threat of being forced to spend $60 million on new plant equipment.

That's the tab for the industry if a proposal is adopted restricting olefin content of gasolines sold in Los Angeles area to 12.5%.

Cost to motorists would be $50,000 per day because marketers would have to add 1 cent per gallon to the price of gasoline to cover the extra cost.

Industry is opposing the plan because gasoline isn't the only offender in creating smog (p. 75).

Over the industry:

Venezuelans are unhappy over plans to relax import controls for Canada and Mexico. Their argument: It's direct discrimination against other producing nations. New furore comes as Congress shows fresh concern over the price effects of the entire control program (p. 62).

Wider well spacing is gaining ground in Texas as a means of cutting exploration costs. But annual TIPRO meeting last week discovered the idea is still far from having universal support (p. 64).

Dry holes are taking the air out of that Los Angeles town-lot drilling boom. Only bright spots in series of ventures over town are on West Side movie lots (p. 60).

Summer fill protection policy is now being offered by Esso Standard for buyers of kerosine and No. 2 fuel.

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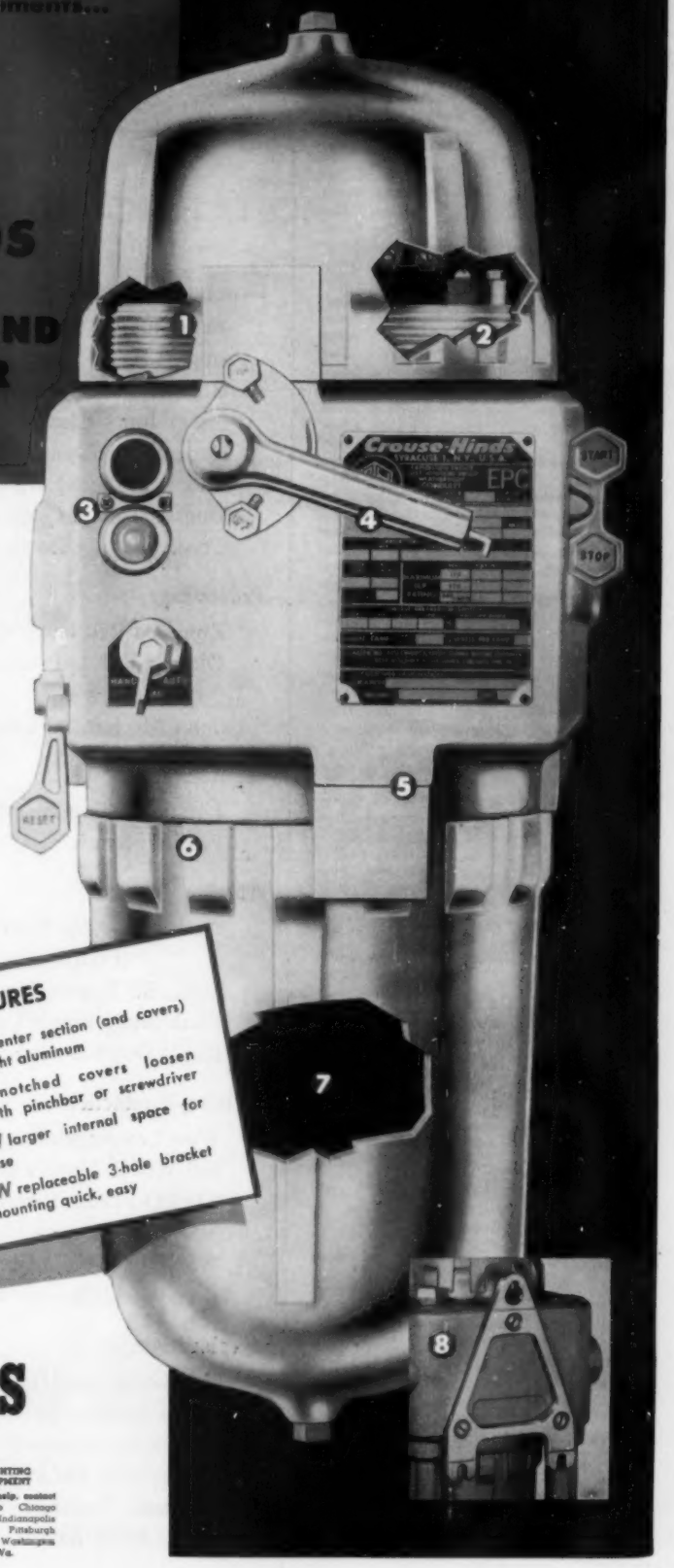


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# TECHNOLOGY—OPERATION

## Refining-Processing

Skelly's HF Alky Unit Points Up New Trends **82**

*By Donald E. Phelps and John C. Reidel*

Extensive aerial cooling is being used successfully. Depropanizer is located ahead of deisobutanizer to reduce corrosion. Shell-and-tube reactors prove out in practice with only 5° F. water temperature rise through the tubes.

Refinery Construction Index **99**

The Foreman's Page **100**

The first in a series on fire protection.

Air or Water for Condensation of Overhead Vapor? **113**

There are several major factors in selecting the right cooling medium: where water supply is inadequate, where high-condensing temperatures are encountered, where water-treating costs are high, and where space is available—the air-cooled heat exchanger looks very promising.

Questions on Technology **117**

Sensitivity and susceptibility of alkylate.

Process Costimating **122**

The cost of operating thermal cracking plants.

## Drilling-Production

What Torque on a Sucker-Rod Joint? **86**

*By Walter H. Ritterbusch, Jr.*

Sucker-rod joint failures are best attacked by applying the optimum preload as related to the allowable working load. These optimum preloads are best applied in field practice by the use of power sucker-rod wrenches.

Low-solids Muds Score High **90**

*By P. O. Pope and John Mesaros*

This is a report on the drilling muds used in the Phillips West Texas deep-well tests. Driscose was used in the muds for all three wells. This material permitted a mud to remain fluid and keep good flow properties in wells which were hot and deep.

Idealized Tank Battery Reduces Crude Handling Costs **119**

*By Stephen S. Brown*

Production-line shelf fabricated equipment is needed so that tank batteries can be put together as unitized shelf items at the supplier's warehouse. Basis for such units is continuous rather than batch measurement.

## Pipelining

Making Compressor Stations Quiet Enough to Live With **96**

*By Warren J. Severin*

The modern turbocharged compressor engine is efficient but noisy. Its roar creates health and morale problems and sometimes makes it an unwelcome neighbor. Here's how two pipeline companies went about a program of noise abatement.

Microwave Replaces Wireline System for Peru Pipeline **114**

Mechanical Watch Dog Looks for Gasoline Vapors **124**

Great Lakes Pipe Line Co. has developed a combustible-atmosphere detector which protects against explosion resulting from gasoline leaks. The device has better reliability than certain other types and its cost compares favorably with commercial equipment.

## General

Equipment Leasing Is on the Rise **103**

*By Robert Sheridan*

Gain was 72% in 1 year—to 19 million dollars in 1958. Leasing is a long-term arrangement normally from 3 to 10 years. Equipment leased in 1958 ranged from $400,000 special installations to office machines.

## DEPARTMENTS

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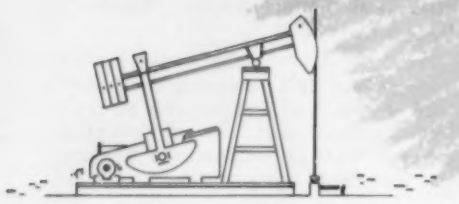

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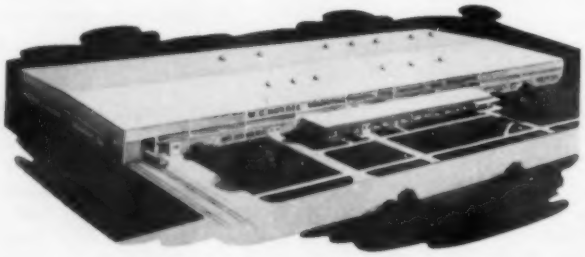

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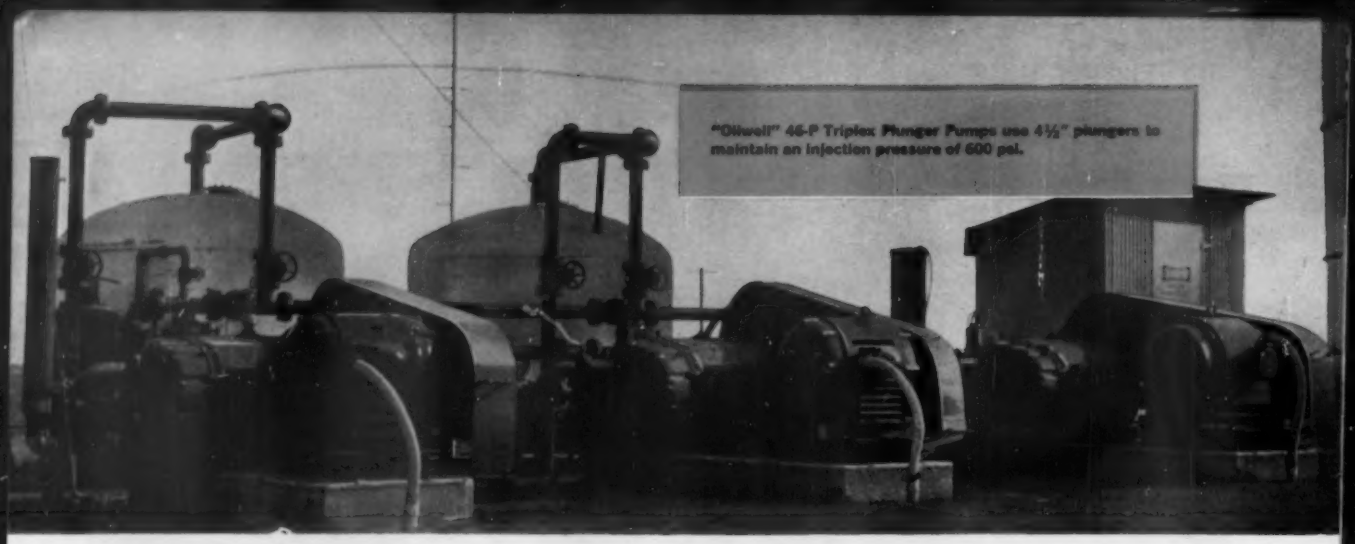

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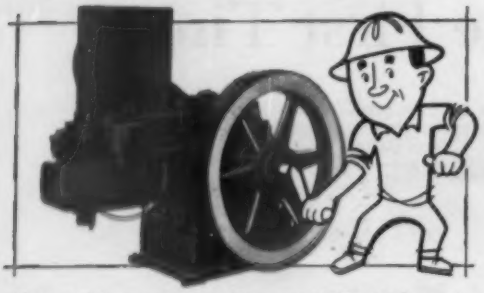
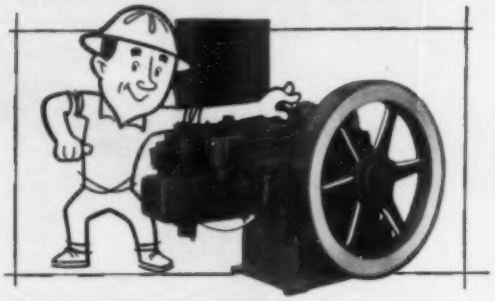
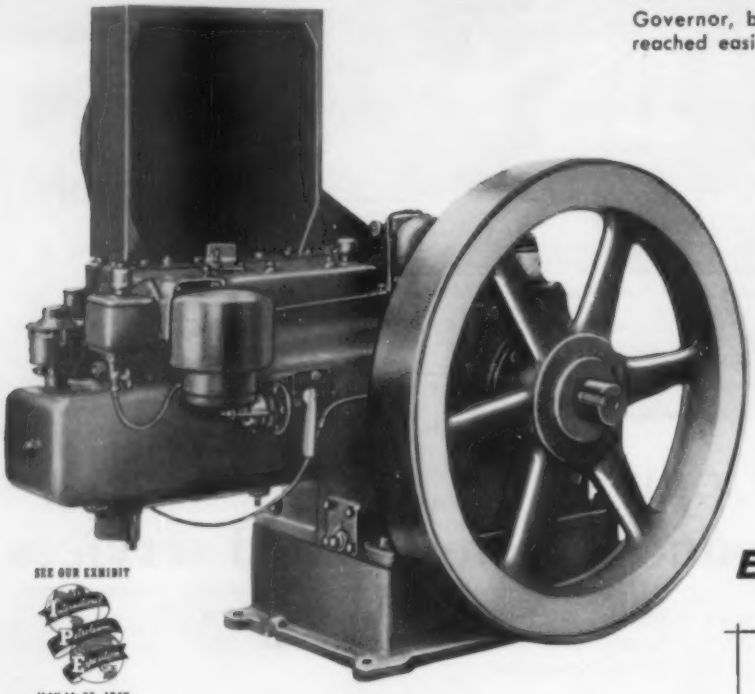


Hot, cold or wet weather conditions do not prevent C-E Engines from starting easily.

## EASY TO ADJUST



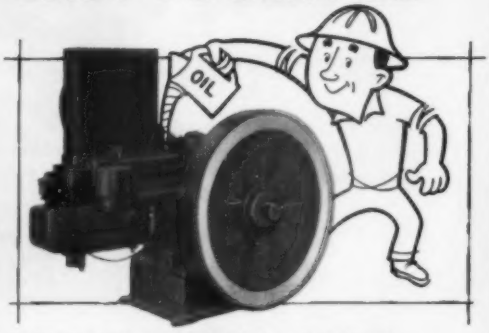
Governor, bearings, carburetor, etc. can be reached easily for quick, accurate adjustment.



SEE OUR EXHIBIT

MAY 14-23, 1959
Tulsa, Oklahoma

## EASY TO SERVICE




Water or oil can be added . . their levels checked . . while the engine is running.

## EASY TO REPAIR

Essential working parts or unit assemblies . . can be replaced in the field without disturbing other assemblies.

## C-E Engines Cut Pumping Costs

It takes less time to service and maintain these engines, so more engines can be checked by fewer field men. Take advantage of this lower cost maintenance . . buy your next pumping engines from Continental-Emsco . . and reduce your production costs.

*For Service that Sings . . Equipment that Hums . . Go . .*

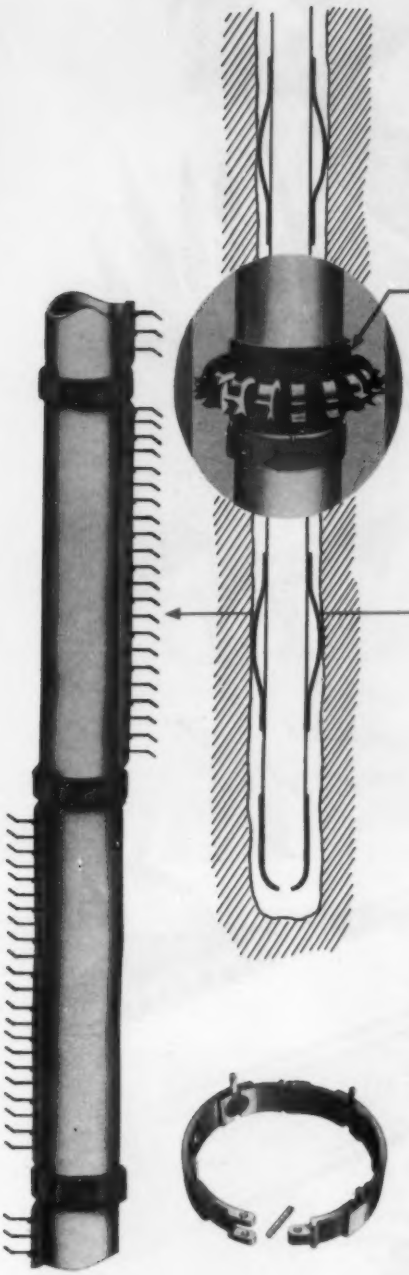
**CONTINENTAL-EMSCO**

*Serving the Oil and Gas Industries ... Worldwide*

CE702

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas
Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada
Continental-Emsco Company C. A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts., England • *Representatives in All Principal Oil Fields of the World*

# *IT'S NO SECRET!* BETTER BONDING BEGINS WITH BETTER WALL CLEANERS by HALLIBURTON



Roto Wall Cleaners Installed with Vise-Lok Limit Clamp

The secret of successfully stronger primary cementing jobs is a better bond ... to minimize precautionary and remedial squeeze jobs.

Halliburton Roto Wall Cleaners and Recipo Wall Cleaners ... are field-proven and are first-choice abrading devices by thousands of well operators for efficient performance—under the most punishing downhole conditions—for the removal of undesirable filter and mud cake from the bore hole ... allowing a stronger bonding of cement to formation and casing in primary cementing.

**RECIPO WALL CLEANER** ... reciprocating type cleaner

*New design offers these advantages:*

- Removal of tough filter cake—without damage to hole wall.
- Circulating pressures and bridging action of cuttings reduced.
- Flexible rubber cleaning fingers minimize bore hole or filter cake damage while running in.
- Tough wide cleaning fingers cover more bore hole area and clean more thoroughly.
- Wide cleaning fingers help to break channeling action of cement.
- Cleaning effectiveness is increased—yet "finger" damage is decreased due to their flexibility which prevents permanent bending.
- Hinged for fast and easy latch-on installation.

**ROTO WALL CLEANERS** ... rotary type cleaner

*New standard designed recessed base and "Claw-Type" Cleaning Spikes provide:*

- Installation on casing by Vise-Lok Limit Clamp or tack welding.
- No bridging off of annulus.
- Permits free-flow of fluids while running casing, cementing and circulating.
- Minimum disturbance of mud cake while running casing to bottom reduces lost circulation problems.
- Reduces hazard of "sticking casing" off casing point.
- Turbulent action of cleaning spikes gives better cement uniformity.
- Construction allows minimum damage to spikes or filter cake while running in—provides maximum force for cleaning when rotating casing.
- Economy—one size base fits all O.D. sizes of casing.
- Slim Hole Roto Wall Cleaners are available for better cementing where annulus between casing and bore hole is small.

**VISE-LOK LIMIT CLAMPS** ... equal to welding even under severe torque loads!

*A new method for positioning auxiliary equipment on casing without welding ... each clamp has these outstanding features:*

- 20,000 pound load-carrying capacity—greater than any non-weld limit clamp or stop collar tested.
- Design and superior lock-on power of the special disc-type slips grip the casing and prevents movement of auxiliary casing equipment.
- Provides selective location and limits travel in either direction.
- Easy installation with hinged design.

For a better bond and cement uniformity on your primary cementing job ... check with your Halliburton Representative about the unique features of Recipo Wall Cleaners ... Roto Wall Cleaners and the *new* method of installation with the Vise-Lok Limit Clamp.

**HALLIBURTON**

**CEMENTING SERVICES**

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

"284 SERVICE CENTERS — JUST MINUTES AWAY FROM YOUR WELL!"

# SPARE PARTS ARE RARE BIRDS

**because...**

**WILLIAMS SUPERJUSTABLES® LAST and LAST and LAST**

Buy Williams
BETTER TOOLS FOR BETTER WORK
From Catalog 303

SEE OUR EXHIBIT
BOOTH No. 37, KANSAS BLDG.
MAY 14 - 23. 1959
Tulsa, Oklahoma

International Petroleum Exposition

WILLIAMS
DROP FORGED
TOOLS OF INDUSTRY

J. H. WILLIAMS & CO.
DIVISION OF UNITED-GREENFIELD CORPORATION
415 VULCAN ST., BUFFALO 7, N. Y.

## For "set it and forget it" gas drying—

# Come to Kemp

Kemp Dryer protects instrument lines at −25° for Quaker State's Farmer's Valley, Pa. plant. Fully automatic operation saves time and manpower, yet provides dependable service on a 24 hour basis.

Here's the nerve center of every Kemp Fully Automatic Gas Drying Unit. Drying process gasses and inerts . . . air for pneumatic instruments and tools . . . liquids . . . for pressurizing anhydrous liquids . . . this panel controls the Kemp Dryer surely and safely. Once timed to meet your program, it provides efficient drying on a continuous basis, without worry or excessive maintenance.

Note the precision with which even the wiring is connected. It's typical of the thorough workmanship going into every component of the Kemp Dryer. Kemp Dryers are built with care; built to last and perform year after year with dependability resulting from a quarter century's experience.

Whether your operation calls for a completely automatic Kemp Dryer, a semi-automatic model, or a simple, manually operated unit, there's a model and capacity to meet your needs. Kemp Field Engineers will gladly study your problem and make complete recommendations, even down to the proper desiccant (we select from over 20) to do your job best.

Your Kemp Representative is listed in *Chemical Engineering Catalog*. Call him for full information when you plan a new installation or wish to update an old one. Or write for Bulletin D-102. THE C. M. KEMP MFG. CO., 405 E. Oliver St., Baltimore 2, Md.

Convection Dryers

Inert Gas Generators

Nitrogen Generators

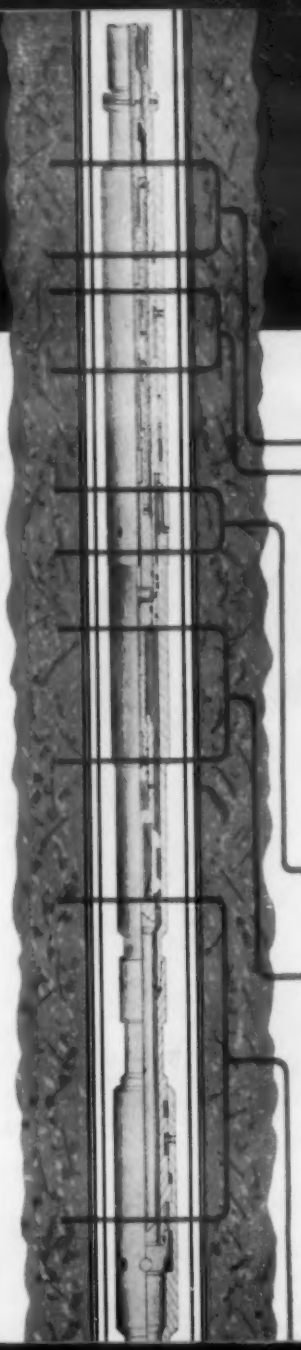
Oriad Dryers

NEW

# JOHNSTON TESTERS

# FULL-BORE TEST AND COMPLETION TOOL

**Now, you can make all the savings in round trips and rig time that result from using a combination test and completion tool without the disadvantages that sometimes result.**



NEW

**THE UNIQUE LOCKING SYSTEM** makes it possible for the testing valve assembly to hold pressure in either direction; therefore, tubing or drill pipe may be pressured-up at any time while going in the hole without the use of any additional equipment.

**TEST VALVE IS EASY TO OPEN** — Simply pick up on tubing, torque slightly to the right and set down. The action is positive and there is no chance of "getting lost" by extensive rotation.

**VALVE SYSTEM OFFERS MANY ADVANTAGES** — **First,** initial shut-in pressure can be taken very quickly with only a minimum flow of formation fluid. **Second,** since the test valve closes before the circulating valve opens, mud from the annulus cannot contaminate the formation. **Third,** valuable rig time is saved because you can reverse circulate while taking shut-in pressures. This "circulating" feature also keeps sediment from collecting on top of the testing valve assembly for easy retrieving.

**EXCLUSIVE JOHNSTON TESTING VALVE ASSEMBLY** is rugged and dependable. Because of the valve arrangement and the recording assembly, you can take as many bottom hole shut-in pressures as you want without returning test section to surface. This means more information from your test. Later tests may be made by simply pumping the test section back in place.

***No rotation is necessary* with this tool during drill stem testing operations.**

**You can take as many** bottom hole shut-in pressures as you want without returning the testing valve assembly to surface.

**You can also squeeze cement,** re-perforate, fracture or acidize without ever pulling the tubing or drill pipe.

**Then, if you need later tests,** you can pump the pressure test section in place without ever making a round trip.

**You can do all these things** with full assurance that you are using a positive tool that is completely safe in operation. There is no guesswork. All operations involve simple up-and-down movement or a minimum of right hand rotation. No damage results from excessive rotation. No left hand rotation is ever required.

**After all operations are completed,** a built-in jar assures packer unseating when unseating is desired.

In addition, this tool is backed by Johnston Testers —the largest operator in the field of drill stem testing. You get all the advantages of Johnston's unparalleled experience when you specify the *Johnston* Test and Completion Tool. Fill out the coupon or drop us a note on your letterhead for full information. Please refer to bulletin number A6.

Please send me complete information on the New Johnston Full-Bore Test and Completion Tool.

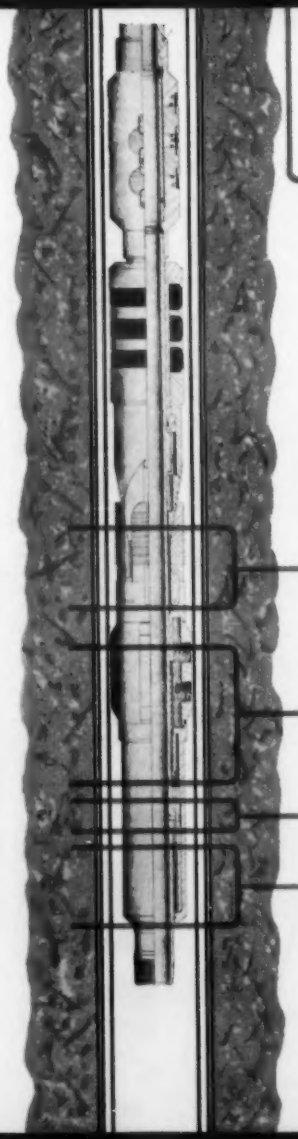
NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

A-6



**JOHNSTON TYPE "T" PRESSURE RECORDER** gives unfailing accuracy, sensitivity and dependability under all testing conditions. This recorder is built to withstand unavoidable oil field jolts and is not apt to be knocked out of calibration. Non-tension type recorders may.

**TWO-WAY ANCHOR SLIPS** enable the operator to take a strain on the tubing without unseating the packer.

**BUILT-IN JAR** makes it easy to unseat packer. As in all other operations, no left hand rotation is required to operate or reset.

**SIMPLE SETTING OF PACKER.** Just pick up, torque to the right and slack-off, and the packer is set. The by-pass valve, which is closed when the packer is set, has a simple and positive opening and closing action.

**FULL OPENING THROUGH TOOL** (when testing valve assembly is out) permits perforating, squeezing, and other operations without difficulty.

PATENTS APPLIED FOR

JOHNSTON TESTERS, INC.

P. O. BOX 98

HOUSTON 1, TEXAS

to see a demonstration of
Cameron's new pressure controls for
drilling and production at the
International Petroleum Exposition,
Tulsa, May 14-23, 1959.

- TYPE "F" BLOWOUT PREVENTERS
- NEW GATE VALVES
- SOLID BLOCK CHRISTMAS TREES
- FLOW CONTROLLERS

Cameron
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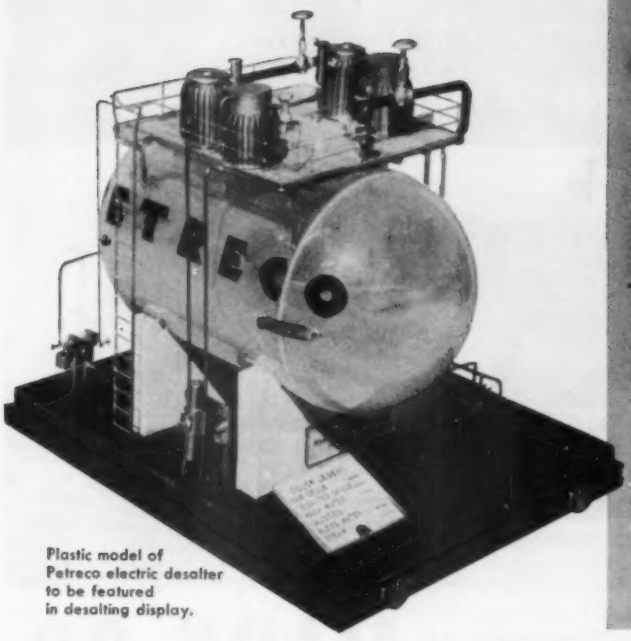
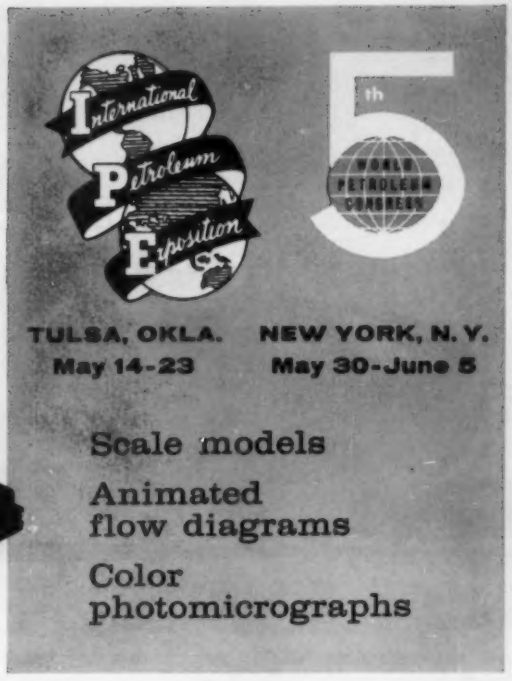
P. O. Box 1212 — Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England, Cameron Iron Works Ltd., 76 Grosvenor St., London W. 1 England.




Plastic model of Petreco electric desalter to be featured in desalting display.




# See all these PETRECO* electric petroleum processes at the IPE and WPC shows!

**ALL-ELECTRIC DESALTING.** Model unit shows how salts, solids and residual BS & W are removed *automatically* from crude.

**ELECTROFINING*.** Flow charts and photographs offer evidence of this highly efficient way to remove acids, $H_2S$, mercaptans, cresols, thiocreosols, sulfur compounds, arsenic, lead, etc., from light to middle range distillates.

**BENDER CATALYTIC SWEETENING.** 3-dimensional flow diagram. Shows modern, low-cost way to sweeten gasoline, jet fuel, kerosine and heating oil without volume loss, air or stream pollution.

**ELECTRIC DEHYDRATION.** Graphic display shows automatic and safety features of Petreco electric dehydrating precipitator.

**SEDIMENT SEPARATION.** 70x photomicrographs of crude oil before and after treatment demonstrate efficiency of sediment removal by Petreco precipitator.

**POLLUTION CONTROL.** Graphic case history display features examples of how Petreco processing equipment prevents air and stream pollution.

**WE'LL BE LOOKING FOR YOU!**

**IPE:** W. side of Drumright Ave., N. of Scientific and Technical Bldg., Tulsa exposition grounds.

**WPC:** Booth #97, 1st Fl., Coliseum, New York City.

PX-59-1

*Registered trademarks of Petrolite Corporation.

PETROLITE CORPORATION

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VENEZUELA: South American Petrolite Corporation, Hotel Avila, Caracas

REPRESENTATIVES

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ITALY: O. Wagner, 149 Via Nemorense, Apt. 1, Rome
JAPAN: Chiyoda Chemical Engineering and Construction Company, Ltd., Tokyo Bldg., No. 3, Marunouchi 2-Chome, Chiyoda-Ku, Tokyo
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# North American's new MARK-20

# 20,000 gallons in one load!

Here is the car railroads have been waiting for to compete better with other forms of transportation. The MARK-20 offers shippers economies in leasing rates, demurrage costs, and handling charges. The MARK-20 offers the railroads lower operating costs and in turn advantage can be taken of incentive rates with higher minimuma.

***Compare the following load limits!***

The MARK-20—approx. 180,000 lbs.

8,000 gallon tank car—approx. 90,000 lbs.

Highway truck maximum—approx. 45,000 lbs.

North American Car will custom build the MARK-20 to shipper's specifications. The car can be insulated, coiled, or compartmentalized. It is domeless for greater strength and can withstand pressure of 100 lbs. per square inch compared with 60 lbs. of most other tank cars.

***Other Features of the***
**MARK-20**

- Electrically welded—no rivets
- Six-inch bottom unloading
- Top unloading device
- 100-ton easy riding trucks
- Outside operated valve
- Hinge bolted 18″ manway
- Tell-tale load gauge
- High capacity 36″ draft gears
- Roller bearings

**Write, wire or phone for full details today**

**NORTH AMERICAN CAR CORPORATION**

**231 South LaSalle Street, Chicago 4, Illinois**
**Telephone Financial 6-0400**

Shippers! Here is the way to reduce your distribution costs and restore traffic to the rails

*Engineering Progress Report*
FROM UNION CARBIDE CHEMICALS COMPANY

# Glycol Dehydrators give 90°F. Dew Point Depressions...

## *Improved regeneration systems give high glycol concentrations*

There are two methods commonly used today to dehydrate natural gas: one employs glycols; the other, dry desiccants. Most authorities agree that glycol systems are less expensive in both initial and operating costs. Recent engineering advances now permit dew point depressions up to 90°F. with economical glycol-type dehydrators. Union Carbide Chemicals Company maintains an extensive engineering service group designed to help the natural gas industry obtain the best possible dehydration service with CARBIDE'S diethylene glycol and triethylene glycol.

### A GRADUAL IMPROVEMENT

Diethylene glycol was first used to dehydrate natural gas in 1936 and by 1939 sixteen glycol type plants were in service providing average dew point depressions in the range of 40°F. Triethylene glycol was first used to dehydrate natural gas in 1949. The dew point depressions realized with glycol type plants have gradually increased until today the standard guarantee is a 65°F. depression or gas containing seven pounds of water per MMSCF, whichever first occurs. For sometime now, some equipment manufacturers have offered a 75°F. dew point depression guarantee.

### FACTORS INFLUENCING DEW POINT DEPRESSION

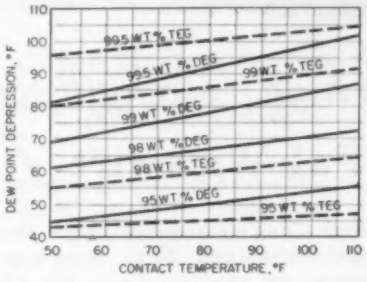
The dew-point depression obtained with a glycol dehydration plant depends upon several factors, such as:

1. Concentration of water in the lean glycol solution.
2. Glycol circulation rate.
3. Contact temperature in the top of the absorber column.
4. Efficiency of gas to glycol contact in the absorber.

Even with conservative design and operation, however, the dew point of the gas leaving the glycol contactor cannot be lower than the equilibrium value for the conditions of temperature and glycol concentration found on the top plate.

### HIGH GLYCOL CONCENTRATIONS

The high diethylene and triethylene glycol concentrations now being obtained in plant practice, prompted studies to determine the dew point depressions obtainable with such solutions.




These data indicate that both diethylene and triethylene glycol at 99.5 per cent concentrations provide dew-point depressions in the 80°-105°F. range.

At concentrations of 98 per cent and lower, diethylene glycol provides better depressions than equal concentrations of triethylene glycol, while at 99 and 99.5 per cent concentrations, triethylene glycol appears to allow a 5°-10°F. lower dew point than diethylene glycol.

### 90°F. DEPRESSION MEETS TRANSMISSION REQUIREMENTS

Glycol regeneration equipment on the market today is capable of producing and maintaining glycol concentrations above 99%. Thus, it is possible for equipment manufacturers to guarantee a 90°F. minimum dew point depression. There are very few instances where a 90°F. depression will not meet the water content specifications of any long distance gas transmission company.

### CARBIDE'S RESEARCH PROGRAM

Dew point depression studies are but one phase of CARBIDE'S extensive research activities designed to improve the products and processes of the natural gas treating industry. CARBIDE'S Technical Service Department stands ready to help you obtain the best possible results from your gas treating installations. For more information on the use of CARBIDE'S glycols for gas dehydration, call the nearest CARBIDE technical representative or write, Union Carbide Chemicals Company, Department B, 30 East 42nd Street, New York 17, N. Y.

*"Union Carbide" is a registered trade-mark of Union Carbide Corporation*

UNION CARBIDE CHEMICALS COMPANY
DIVISION OF
UNION CARBIDE
CORPORATION

## *For extra high strength wire rope...*
## *use* CF&I-Wickwire *Double Gray*

The CF&I Image reflects CF&I's experience as a producer of many steel products and CF&I's versatility in developing new products to meet exacting requirements . . . like Wickwire Double Gray*.

The special steel used in Double Gray provides extra resistance to the deforming effects of peening and crushing which occur on the drums and sheaves of heavy equipment. Double Gray also gives extra resistance to abrasion.

Because of these superior qualities, Double Gray rope quickly repays its slightly higher initial cost in safer, more economical operations. Use it wherever extra high strength wire rope is required.

For a free copy of our Double Gray booklet, write to: Advertising Department, The Colorado Fuel and Iron Corporation, 575 Madison Avenue, New York 22, N. Y.

**Wickwire Double Gray Wire Rope is made of extra-improved plow steel. Fortified by an independent wire rope core of the same extra high strength steel, Double Gray rope has a 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.*

6632

**WICKWIRE ROPE**

**THE COLORADO FUEL AND IRON CORPORATION**

*In the West:* **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque · Amarillo · Billings · Boise · Butte Denver · El Paso · Farmington (N.M.) · Fort Worth · Houston · Kansas City · Lincoln · Los Angeles · Oakland · Odessa (Tex.) Oklahoma City · Phoenix · Portland · Pueblo · Salt Lake City · San Francisco · San Leandro · Seattle · Spokane · Tulsa · Wichita

*In the East:* **WICKWIRE SPENCER STEEL DIVISION**—Boston · Buffalo · Chattanooga · Chicago · Detroit · Emlenton (Pa.) New Orleans · New York · Philadelphia

CF&I STEEL

# NEW! HUMBLE NEBULA EP-1 GREASE CARTRIDGES

The NEBULA EP-1 grease cartridge eliminates the worst part of greasing—the messy job of refilling the grease gun from a pail. Just slip the caps off the cartridge, insert it in your grease gun, and you're ready to grease any fitting. There's no waste of grease, and no possibility of dirt or foreign matter getting into the grease.

NEBULA EP-1 is an outstanding multi-use grease. Its exceptional resistance to the effects of heat, water, oxidation and heavy loads makes NEBULA EP-1 top choice for equipment that works outdoors where rain, moisture, dirt, dust and high temperatures are encountered.

NEBULA EP-1 gives excellent lubrication and protection whether your equipment is working at high or low speed, the load is light or heavy, and whether the temperature is hot or cold.

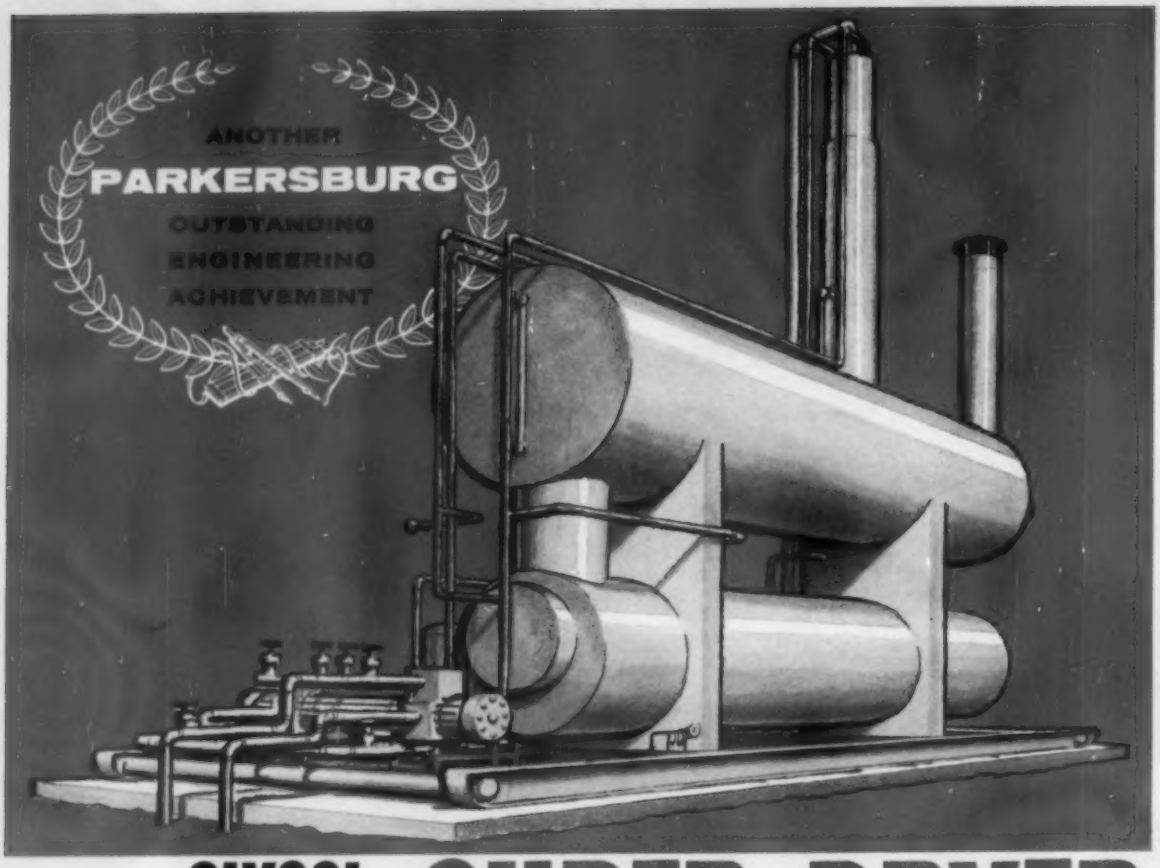
**SPECIAL INTRODUCTORY OFFER!**

*Free* lever-action grease gun with every 60-cartridge case of NEBULA EP-1 purchased. But hurry—deadline on this special offer is August 1, 1959.

*For quick delivery of NEBULA EP-1 grease cartridges, call your nearest Humble wholesale plant in Texas and New Mexico.*

**HUMBLE**

**HUMBLE OIL & REFINING COMPANY**




# GLYCOL DEHYDRATOR SUPER-DRYER

**PARKERSBURG**
**Exclusives:**

- Higher dewpoint depression with lower reboiler temperatures
- Reduced glycol losses through use of integral reflux condenser
- Prevention of corrosion through airtight construction
- More water removal from glycol through better reconcentration

The PARKERSBURG Super-Dryer provides that *extra* service where conventional dehydrators are inadequate for the job, offering a *bonus* of safe reboiler temperatures demanded by such increased loads.

All units have completely automatic controls for unattended operation, even in sub-zero weather.

THE PARKERSBURG RIG AND REEL CO. — PARKERSBURG WEST VIRGINIA — MADE IN U.S.A.

*See Your* **PARKERSBURG** *Man Today!*

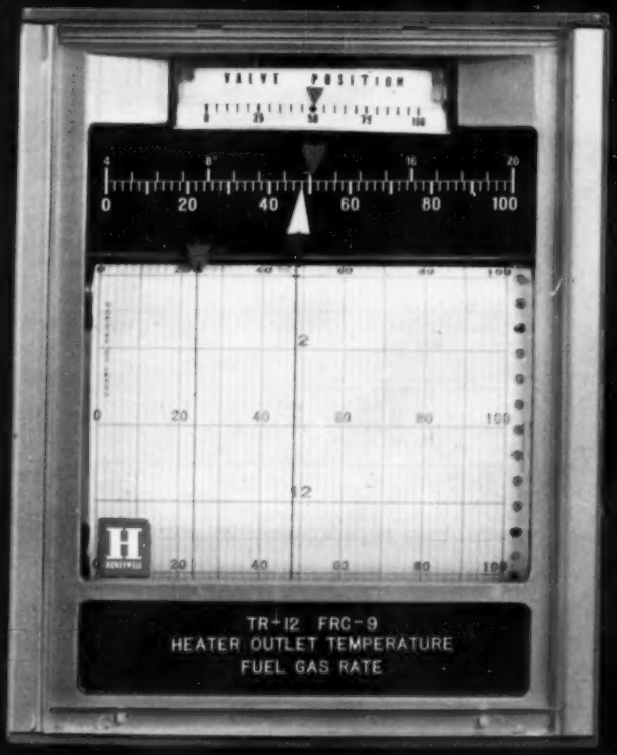
THE
**PARKERSBURG**
RIG AND REEL COMPANY
*Division of Parkersburg-Aetna Corp.*

HOUSTON • TULSA • PARKERSBURG

# Here it is!

## Honeywell's new *ElectriK Tel-O-Set** system

...the only true two-wire system for electric process control!




*No line power connections in the field.* The *ElectriK Tel-O-Set* system requires no external power at any field-mounted device and uses only two wires between it and the control room. These two wires form a series circuit that carries the measurement or control signal as well as the system's power. The only line power connection is made at the receiver.

Two-wire transmission sharply reduces installation costs. Add this to the fact that the *ElectriK Tel-O-Set* system's d-c transmission eliminates the need for shielding the wires, and you have the simplest, most economical installation possible.

*Trade name, Minneapolis-Honeywell Regulator Company

HONEYWELL

**COMPARE *ElectriK Tel-O-Set* WITH ANY OTHER ELECTRIC CONTROL SYSTEM!**

# Here it is!

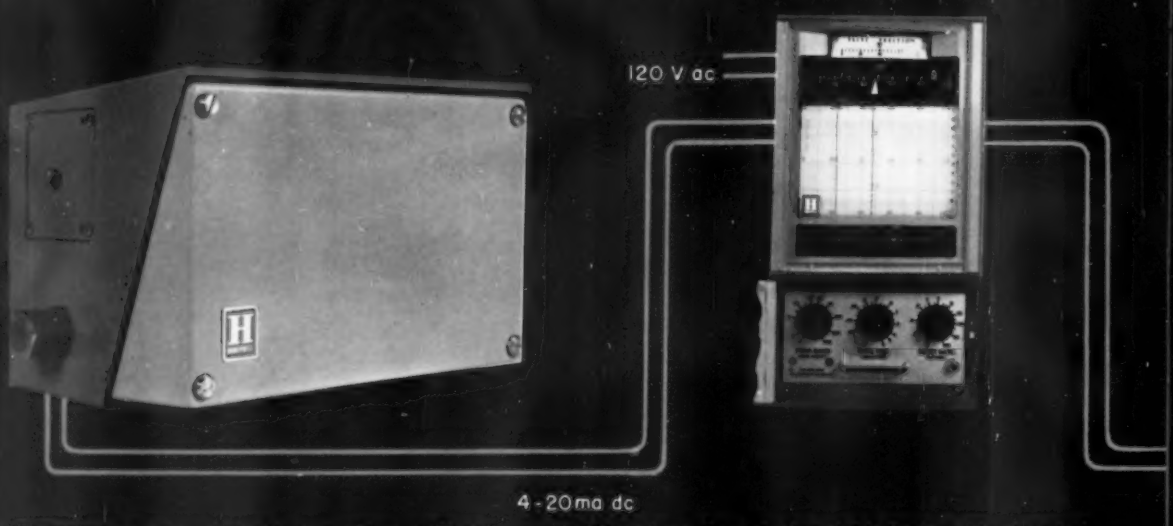
## the new *ElectriK Tel-O-Set* system...newest advance

### *A complete, integrated line...*

Control *any* industrial process with the *ElectriK Tel-O-Set* system. It has been designed as a complete system, rather than as a collection of individual instruments. The line consists of 22 major units which permit local and centralized data presentation, adjustable cascade control, ratio control, and many other auxiliary functions. *ElectriK Tel-O-Set* transducers make the line completely compatible with your present pneumatic instruments.

### *...built for industry*

Die-cast aluminum cases and stainless steel components are used throughout the line to withstand the rough handling and demanding environments of industrial applications. Standardized components, together with extensive use of quick-connect and plug-in design, mean ready interchangeability of parts, reduced spare parts inventory, easy maintenance. The modular, or "building block" concept is employed throughout for maximum flexibility, with all components needed for a particular function housed in a single case.




All process and external electric connections to *ElectriK Tel-O-Set* field-mounted transmitters are entirely isolated from inside the case . . . to permit installation without the need for instrument department supervision.

All receivers, from single-point indicator without control to two-pen ratio-cascade control station, are housed in the same case and all use the same panel cutout of 5½ x 6 inches. Controllers can be mounted with adjustments in front or back of panel.

**Choice of three cases**

for field-mounted *ElectriK Tel-O-Set* units: Weatherproof (left) for Division 2 locations; relay rack (center) for mounting four abreast in a 19-inch rack, and explosion-proof (right) for Division 1 locations. All are completely transistorized and have quick-connect electric and pneumatic plugs.

**COMPARE *ElectriK Tel-O-Set** WITH ANY OTHER ELECTRIC CONTROL SYSTEM!**

## in industrial process control

### ...this is how it works

The basic *ElectriK Tel-O-Set* system consists of a transmitter, receiver, controller and final control element, usually a valve. The transmitter measures any process variable, translates it into a standard 4 to 20 milliampere direct current signal, and transmits to the receiver through a pair of copper wires. The receiver indicates or records the signal in terms of the actual value of the process variable, compares it with a predetermined set-point, and sends the difference to the controller as an error signal. The controller then converts this into a corrective 4-20 milliampere output to operate the control valve—again transmitting over a single pair of copper wires.

**VALVE OPERATOR**

4-20 ma dc

*All ElectriK Tel-O-Set field-mounted units . . . whether transmitter, transducer, or valve actuator . . . operate at ambient temperatures of —40 to 150°F. They all work on the same force-balance principle and use many similar components.*

## SYSTEM COMPONENTS

### Transmitters

Process pressure to current (PP/I)

Differential pressure to current (Δ P/I)

Millivolt to current (MV/I)

### Recorders

Single or two-pen recorders

Single or two-pen recording controllers with control, including simple cascade, on one pen

Two-pen recording controllers with ratio or cascade control on one pen

### Indicators

One pointer, with or without control

Milliammeter, with or without manual loading

### Controllers

Two mode and three mode

### Final Control Elements

Current to pressure (I/P) valve operator

Electro-pneumatic positioner

Electro-hydraulic actuator

### Transducers

P/I: 3-15 psi to 4-20 ma dc

I/P: 4-20 ma dc to 3-15 psi

I/F: 4-20 ma dc to frequency

F/I: frequency to 4-20 ma dc

### *Transistors . . . for greatest reliability*

Transistors are used throughout the *ElectriK Tel-O-Set* line to assure utmost dependability. Since transistors require no power for operation other than that of the signal being transmitted, no external transmitter power is required. The 4-20 ma d-c signal used in the system is consistent with optimum transistor performance . . . eliminates line resistance difficulties.

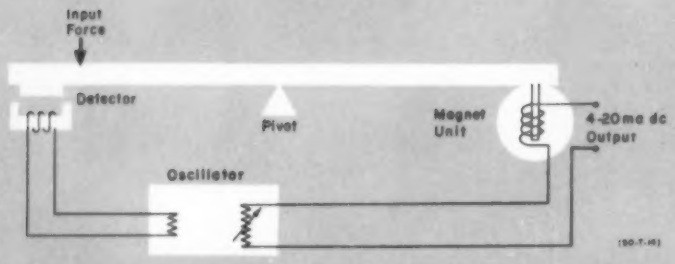
**Honeywell**

First in Control

# Here it is!

## *The high accuracy and swift response you want ... assured by this simple force-balance principle that underlies all* **ElectriK Tel-O-Set** *instruments*

All *ElectriK Tel-O-Set* transmitters, receivers and final control elements operate on a simple force-balance principle . . . a principle that increases accuracy and dynamic response by decreasing hysteresis effects and sensitivity to ambient conditions.




The force balance circuit has four basic parts—a beam, detector, oscillator, and magnet unit. Input force deflects the pivoted beam. This changes the gap in the detector, which consists of two pieces of ferrite; one mounted on the beam, the other on the chassis. As the spacing between the two pieces of ferrite changes, there's a proportionate change in the inductance of the coil which is wrapped around the stationary portion of the detector. When this happens, the oscillator changes its output accordingly, between 4 and 20 milliamperes. This current is fed back to the magnet unit, producing a force on the beam that is equal and opposite to the input force, limiting full-scale beam motion to approximately one-thousandth of an inch.

### *Simplified maintenance*

The use of common parts like the basic detector, oscillator, and magnet units throughout the *ElectriK Tel-O-Set* line is an enormous maintenance advantage—as is the extensive use of quick-connect and plug-in components. All adjustments are quickly and easily accessible, either externally or just inside the case. Even the explosion-proof housings have external zero adjustments. Most process and external electrical connections are of quick-connect design, and are entirely isolated from the inside of the various cases . . . so that your installation crews can install the instruments without standby supervision.

**COMPARE *ElectriK Tel-O-Set** WITH ANY OTHER ELECTRIC CONTROL SYSTEM!**

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL
21 Penn St., Fall River, Mass.

**Honeywell**

First in Control

FR 2800-227M

*". . . driving,*

*progressive spirit. . ."*

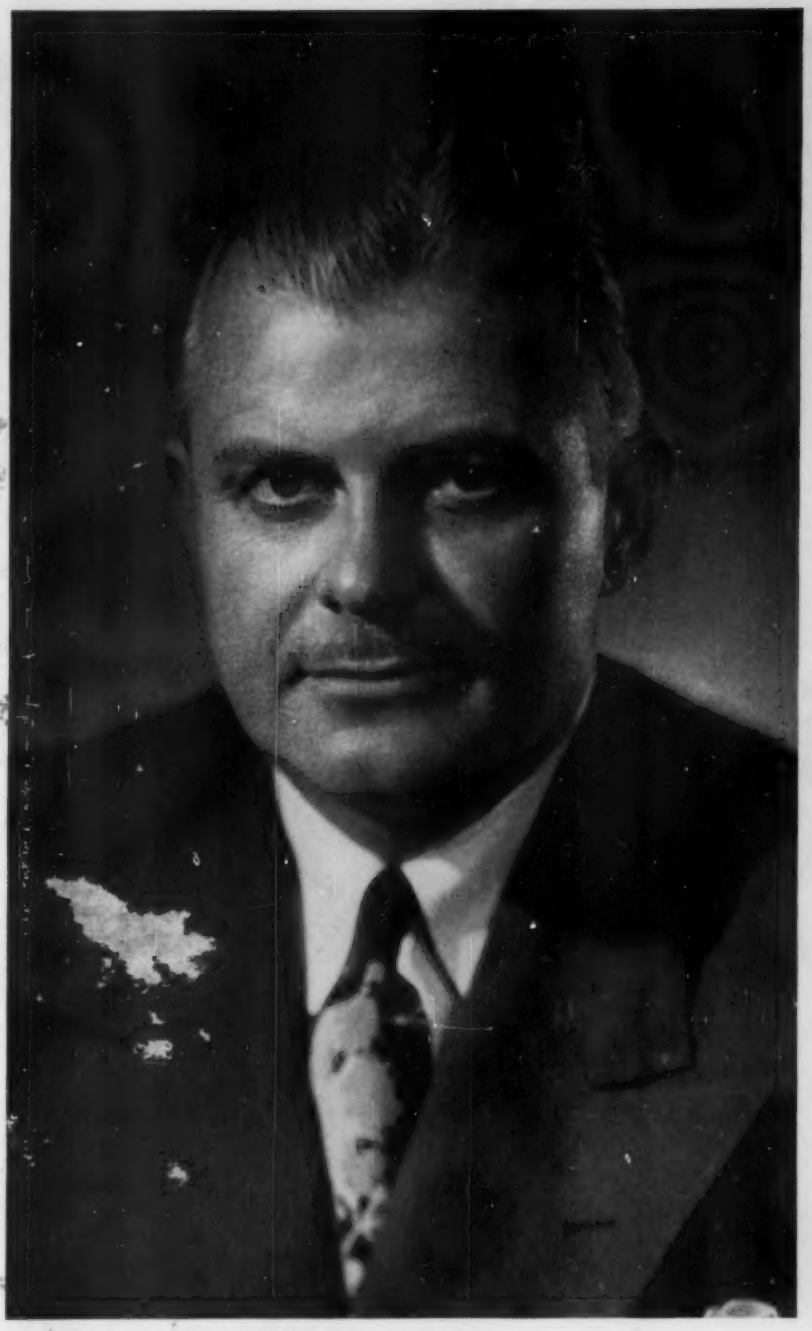
"The greatness of the United States has come from the ability of a free people to make more and better things.

"One of the best examples of progress under free enterprise is the Petroleum Industry. Today's fine motor fuels and oils and such chemical wonders as plastics, miracle fibers and even medicines from this industry are the result of competition and research.

"These things might not be so plentiful, might not have been available so soon, without the fine cooperation of all segments of the industry.

"The manufacturers, suppliers and distributors, for instance, have been able to furnish the equipment when it was needed for deeper drilling, increased production and tough technical problems. They have provided the advanced tools and machinery that have helped keep the cost of producing petroleum and processing its products at a minimum.

"The fighting, driving, progressive spirit of these people is indicative of the whole industry. The ability of the manufacturing companies to provide equipment and make it available through dependable distributors enables our industry to perform its vital function of serving consumers."



MR. K. S. ADAMS

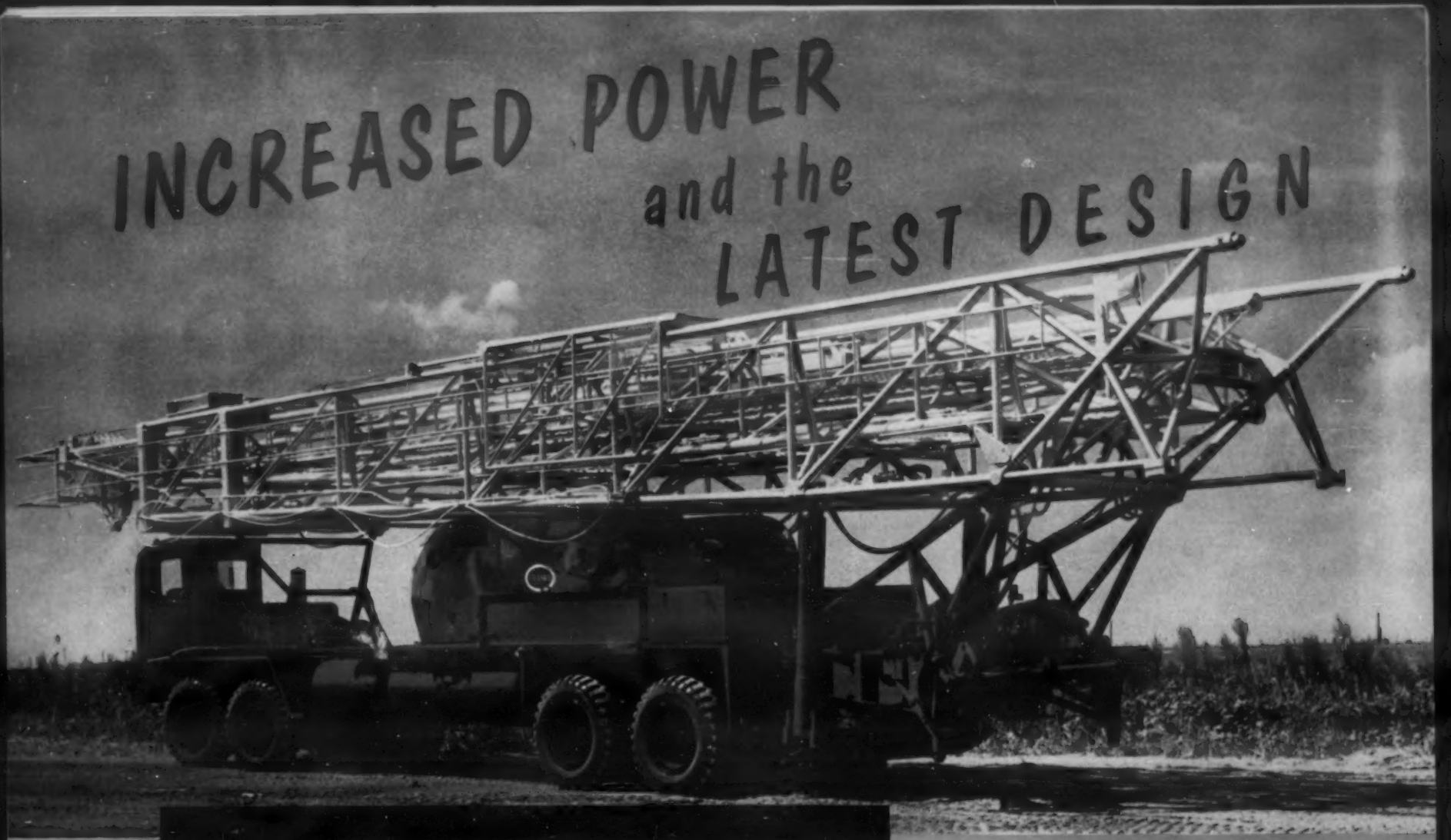
*Chairman and Chief Executive Officer*
*Phillips Petroleum Company*

P.E.S.A.

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

PROUD TO BE PART OF A PIONEERING INDUSTRY

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION




LEADING SERVICING AND WORKOVER
MEN IN YOUR AREA

FRANKS EXPLORER

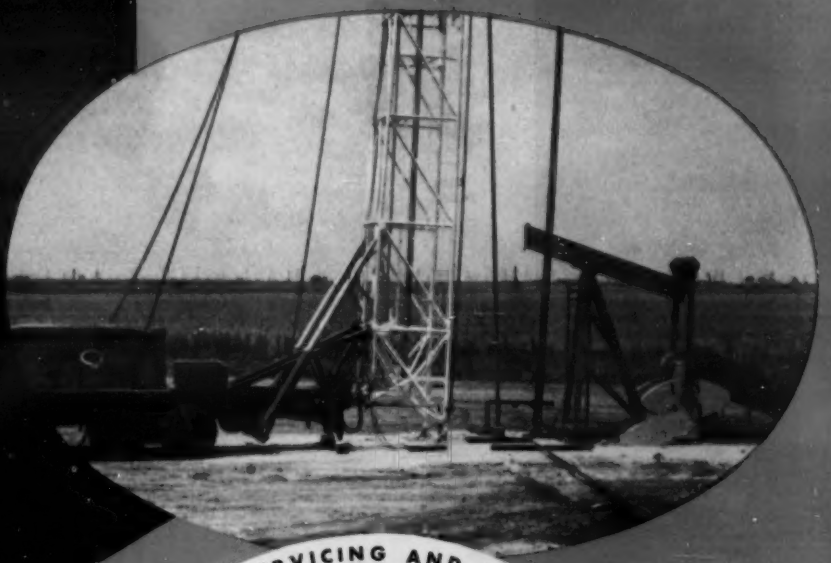
. . . WILL TELL YOU THAT TO MEET THE INCREASING DEMANDS OF SERVICING AND WORKOVER TODAY IT TAKES EQUIPMENT LIKE THE FRANKS EXPLORER TO DO THE JOB.

THEY'RE OUTSELLING OLDER DESIGN UNITS.

TO GIVE BETTER SERVICE USE FRANKS

TO GET BETTER SERVICE USE FRANKS

EASY UP!
EASY DOWN!



## EXPLORER FEATURES

NEW HARDENED, REMOVABLE FLOATING BRAKE RIMS.
NEW CONTROLS for easier, faster, safer handling.
ALL MODELS AVAILABLE WITH TORQUE CONVERTERS.

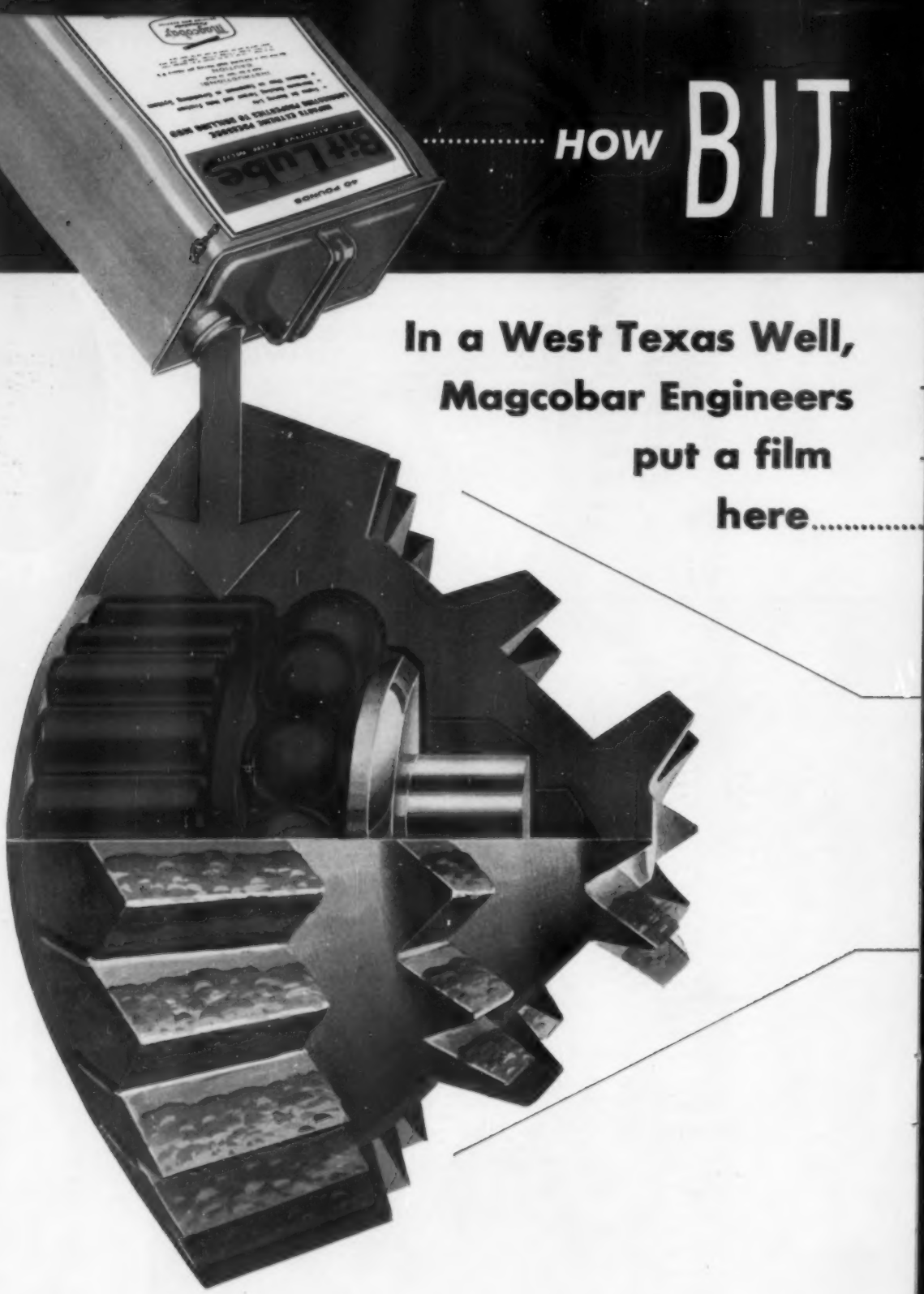
INDUSTRIAL ENGINE — Waukesha, Cummins, G.M. or equivalent up to 400 H.P.
NEW MAIN DRUM DESIGN for fastest, safest pulling.
NEW WATER AND AIR COOLING BRAKE SYSTEM. (Pat. applied for.)

WELL SERVICING AND DRILLING UNITS
FRANKS
DIVISION OF
PAMPA, TEXAS
CABOT

SEE OUR EXHIBIT AT INTERNATIONAL PETROLEUM EXPOSITION—MAY 14-22, TULSA, OKLAHOMA

HOW BIT

**In a West Texas Well, Magcobar Engineers put a film here.....**



*Another* Well Done *with*

# LUBE AND MAGCOBAR ENGINEERING CUT DRILLING COSTS

You are always sure of getting every cost-cutting advantage with Magcobar. Here's why: The Magcobar Mud Engineer combines a thorough knowledge of drilling fluid chemistry with experience in your drilling area. This background—plus the top mud lab in the country—gives new dimension to the finest and most complete line of drilling mud products. What does this mean to you? The highest level of product performance to cut your drilling costs.

**..... to make net savings of $4.87 per foot**

Here's proof of actual savings using Bit Lube (E. P. Additive for Mud). The table below shows a drilling cost comparison in the Brownfield, Texas, area. The Bit Lube well was drilled for $4.87 per foot less than the offset well.

| | NO. BITS | BIT SIZE | INTERVAL | ROTATING HOURS | WEIGHT ON BIT | RPM |
|---|---|---|---|---|---|---|
| BIT LUBE-WATER | 28 | 7⅞" | 4919-7272 | 185 | 70-90,000 | 60-80 |
| WATER | 40 | 7⅞" | 4936-7270 | 379 | 45-60,000 | 55-60 |

Total savings in bits, trips, and drilling time was $13,420. Bit Lube and emulsifiers cost $1,940; a net saving of $11,480!

Bit Lube forms a tough protective film to reduce friction and to increase bit bearing life under extreme pressure conditions. It works best with high weight on the bit and fast rotary speed. Bit Lube and Magcobar engineering may be the answer to your bearing failures.

Bit Lube is only one of Magcobar's many answers to the problem of high drilling cost, a problem that demands the right answers. You'll find that the right products *used right* by Magcobar can cut costs on your next well, too.

Magcobar
*Complete*
DRILLING MUD SERVICE

**MAGNET COVE BARIUM CORPORATION**
HOUSTON, TEXAS

59-200

*Magcobar Technology !*

From the Persian Gulf to the Mediterranean . . .

# AAF cleans dust-storm air

Trans-Arabian Pipe Line Co.'s portable gas-turbine pumping unit at Jalamid, Saudi Arabia, operates unattended—though far out on the hot, dusty desert! 5000-hp turbine drives 5200-rpm centrifugal pump (in van, top of fenced-in area). Clean air from AAF filters is provided for turbine and control rooms.

# along 1000-mile desert pipeline!

Dust storms and 120° temperatures are frequent along the 1068-mile trans-Arabian pipe line system—from oil fields near the Persian Gulf to the offshore loading terminal on Lebanon's Mediterranean coast.

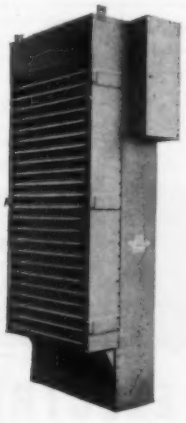
In both unattended portable and permanent pumping units along the vast line, power equipment capable of moving 460,000 bbl. per day is protected by *clean air* from AAF's high-efficiency, self-cleaning filters. The dust-free ventilating air in the unattended portable units also carries off excessive heat and oil vapors, minimizing the risk of igniting from hot turbine surfaces.

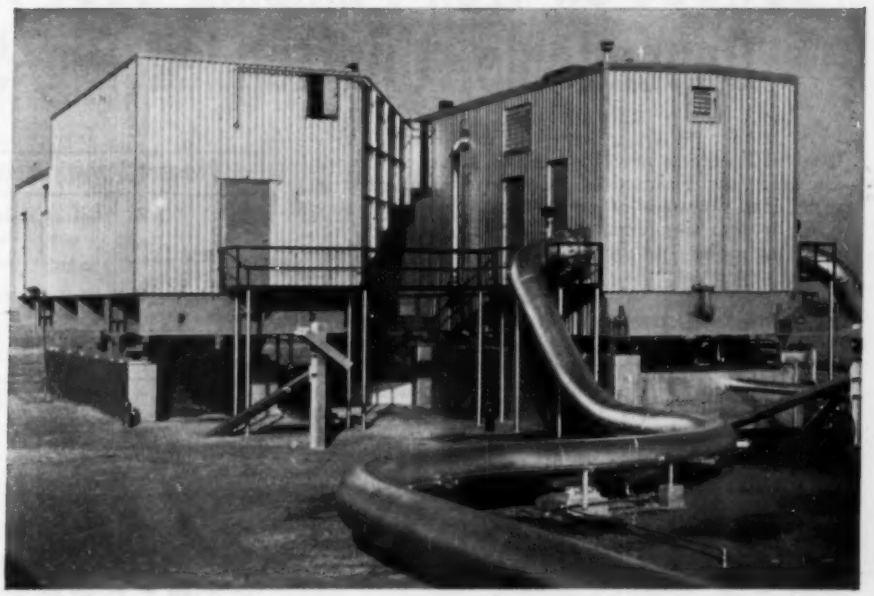
For Arctic regions and temperate climes (as well as arid deserts), AAF designs maintenance-free filters to provide clean intake air for the safe, efficient operation of your compressors and engines. For complete information, call your nearest AAF representative, or write for Bulletin 150. Address: Mr. Robert Moore, American Air Filter Co., Inc., 444 Central Avenue, Louisville, Kentucky.

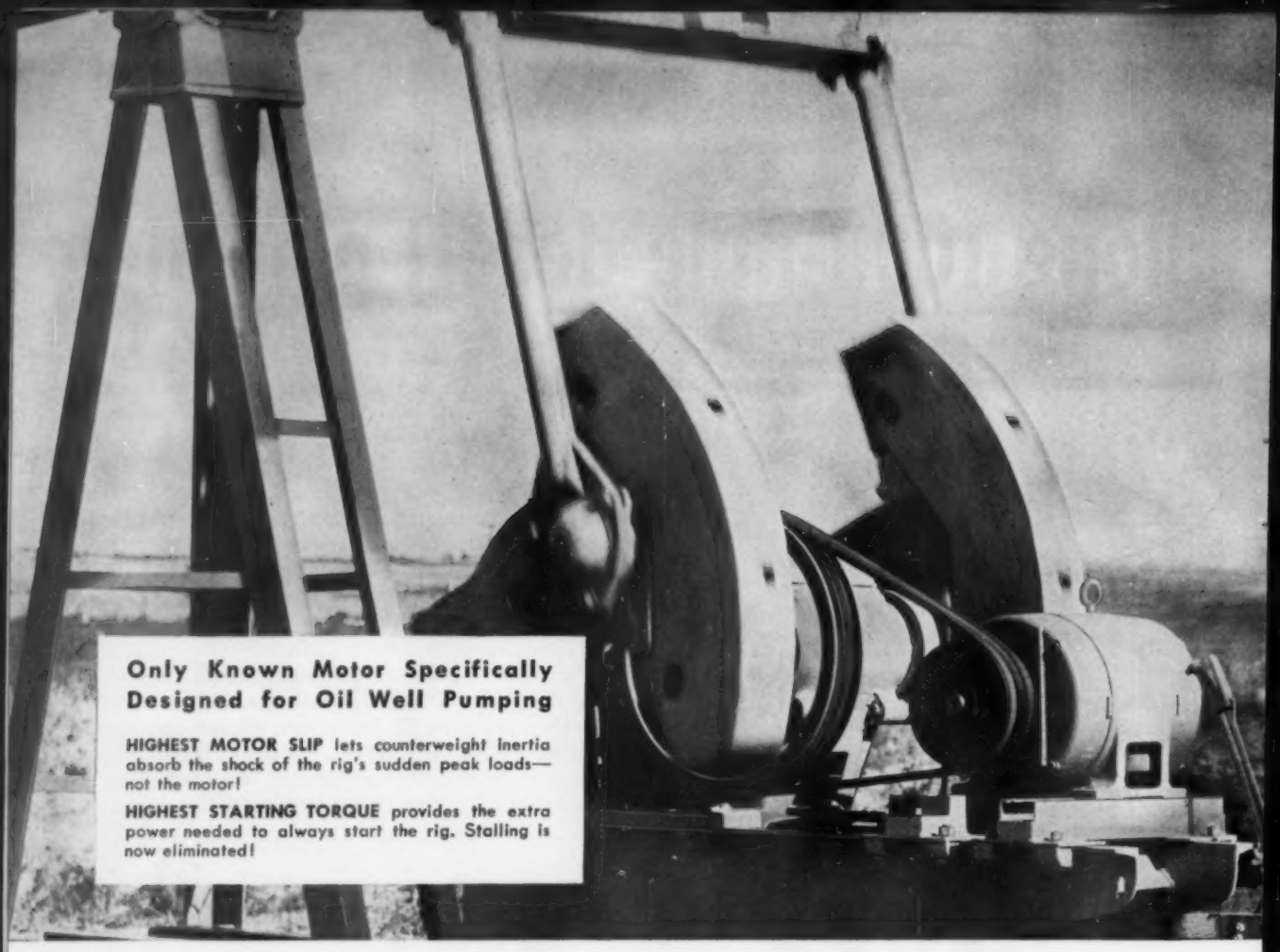
**American Air Filter**

BETTER AIR IS OUR BUSINESS

AAF Type CMS Multi-Duty self-cleaning filters (below) assure clean air for unattended Tapline pumping units. (Right) Filters in left van clean air as it passes to turbine room in right van. 24-inch line in foreground links turbine van with Tapline's main 30- and 31-inch line.






Only Known Motor Specifically Designed for Oil Well Pumping
HIGHEST MOTOR SLIP lets counterweight inertia absorb the shock of the rig's sudden peak loads—not the motor!
HIGHEST STARTING TORQUE provides the extra power needed to always start the rig. Stalling is now eliminated!

*NEW GENERAL ELECTRIC TYPE KOF MOTOR NOW MAKES POSSIBLE . . .*

# Lowest Oil Well Pumping Cost Per Barrel; Dependable, Unattended Rig Starting

General Electric's new Type KOF motor is the only known motor designed specifically to handle the unusual load demands of oil well pumping rigs!

Eight- to ten-percent slip—highest of any oil well pumping motor—lets the rig's inertia smooth out load and current peaks that often damage ordinary motors and cause voltage fluctuations. This means lowest kw-hr cost per barrel pumped!

Four-hundred-percent (400%) starting torque gives General Electric's new Type KOF the extra power needed for dependable starting on unattended rigs. Highest starting torque prevents stalling and costly motor burnout!

No other motor has been designed so completely around the requirements of the oil well pumping application. For the full story call your authorized motor distributor or nearby Apparatus Sales Office; or write direct to Section 899-4, General Electric Co., Schenectady 5, N. Y.

**Compare General Electric's New Type KOF Motor**

| | Starting Torque | Motor Slip | Double-end Ventilation | 762-volt Connection | Regreasable Design |
|---|---|---|---|---|---|
| General Electric (Beam-type Pumping Motor) | High | 8-10% | Yes | Yes | Yes |
| Manufacturer "A" (NEMA C) | Low | 2-3% | No | No | No |
| Manufacturer "B" (NEMA D) | Med. | 5-8% | Yes | No | Yes |
| Manufacturer "C" (NEMA D) | Med. | 5-8% | No | No | No |

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

# MURIATIC ACID?

To be candid... there's nothing new about the acid but there's this new and singularly complete Stauffer brochure. Pages, 44... Tables, 15... Graphs, 9... Illustrations, 24... and many pages of informative text on the major uses of Muriatic Acid.

Now ready for mailing and every consumer should have a copy. Write to either of the addresses below.

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Division of Stauffer Chemical Company
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STAUFFER CHEMICAL COMPANY • 380 MADISON AVENUE • NEW YORK 17, NEW YORK

# You Will Find Old Friends and New Equipment Here

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• Truck-Mounted Drilling Rigs
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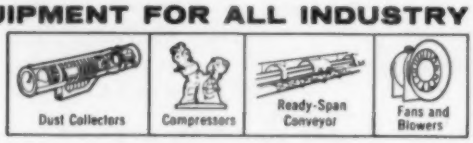
• Air Motors
• Ventilating Fans

**1959 INTERNATIONAL PETROLEUM EXPOSITION**

**AIR MOVING EQUIPMENT FOR ALL INDUSTRY**




JOY

**Joy Manufacturing Company**
**Oliver Building, Pittsburgh 22, Pa.**

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

## *Any way you look at it--*

# TRIPLE STRING

**completions are rewarding to the operator. With today's advanced tools, production and completion operations are entirely safe. Each year brings improved equipment and techniques, such as the fully retrievable hydraulic-set packers now available.**

# TRIPLE STRING

**completions can be made at very little additional cost. After all, it's a matter of pure economics. Fewer wells need be drilled and payout is faster. P · R · I · M · E® completions have operational advantages due to flexibility of down-hole arrangements.**

# TRIPLE STRING

**completion equipment was developed by Brown Oil Tools—and don't forget, Brown can supply your needs for single, dual and quadruple string installations.**

**There is a Brown Oil Tools representative near you. Ask him for the latest information on *multiple alternate completions.***

**Visit our booth (59-60) in the Texas Bldg. at the Tulsa Oil Show.**

BOT

BROWN

OIL TOOLS, INC.

8490 KATY ROAD HOUSTON, TEXAS

**P · R · I · M · E® — (Parallel Retrievable Independent Multiple-string Equipment)**

# "Got it!" 99 and 95/100% pure!

Neat trick! A number of years ago Universal's chemical researchers needed several gallons of benzene in extremely pure form. They secured a quantity of the highest purity commercial grade available. Using precision distillation equipment, they removed an appreciable amount of black, gummy material—and secured a benzene product 99.95% pure!

But this is nothing new to the petroleum refiner of today. The well-known and widely-used UOP Udex® process does even better—produces benzene in tank car quantities, with even higher purity.

Developed by Universal from an idea originated by a leading chemical firm, Dow Chemical Co., the Udex process produces the purest petrochemicals—base stocks for making plastics, pharmaceuticals, soaps, detergents and other widely-used products. It is licensed by UOP to refiners large and small throughout the free world.

Research is where you find it. And one of the functions of UOP is to bring its benefits to petroleum refiners everywhere.

UOP®

**UNIVERSAL OIL PRODUCTS COMPANY** 30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U.S.A.

*More Than Forty Years Of Leadership In Petroleum Refining Technology*

# MORE WAYS THAN ONE

## TO BE AN OIL MAN

Ask the toolpusher what he is, and he says he's an oil man. Ask the mud dealer, the wire line operator, the supplier. Ask the tool rental man, ask the man 'dozing the slush pits, the drilling contractor, the producer. They are all oil men. And the oil industry depends on all of them and many more.

The Oil and Gas Department of The National Bank of Commerce of Houston has helped and is helping all of these oil men. The Commerce can help you because it knows what it's talking about, and, even more important from your point of view, it knows what *you're* talking about. If you are planning to drill, if you are planning to extend needed services, if you are in the oil business, you'll find that The National Bank of Commerce will help you all the way.

**E. O. Buck,** *senior vice president*
*Oil and Gas Department.*

**THE NATIONAL BANK OF**
**COMMERCE**
***OF HOUSTON***

**GULF BUILDING MAIN AT RUSK HOUSTON**

*Facilities of the Oil and Gas Department of The National Bank of Commerce of Houston are available in Wyoming, Nebraska, Colorado, New Mexico, Louisiana, Mississippi, and Texas.*

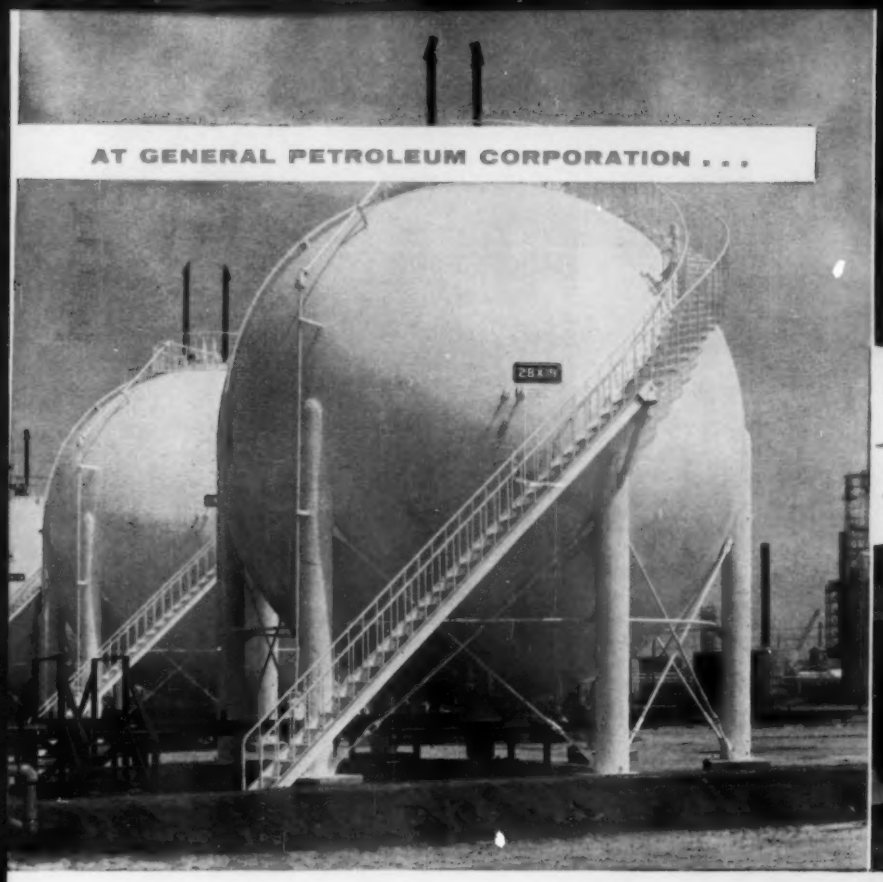
MEMBER
FEDERAL
DEPOSIT
*INSURANCE*
CORPORATION

"There will be more than 190 million Americans by 1965 and more than 220 million by 1975. This means growing markets. It means stepped-up demands for industrial production, for transportation and for other services. It means greater use of oil." – Eugene Holman, Chairman of the Board

ESSO

**Standard Oil Company (New Jersey)**

**and affiliated companies**



*Portable X-ray unit used by CB&I to inspect welded seams on field erected work.*

Two 31-foot diameter Hortonspheres® designed for 250 lbs. per square inch pressure, store propane at Company's Torrance, California refinery.

*Multiple point potentiometer is used to electronically record the temperatures on various points of the structure during stress relieving.*

# Hard Working HORTONSPHERES® stress relieved and X-rayed in the field

To meet a specific set of customer requirements, these high pressure, 2,778-barrel capacity Hortonspheres were fabricated at CB&I's Salt Lake City plant and then stress relieved and X-ray inspected *after* they were erected for General Petroleum Corporation's refinery.

Field X-ray and stress relieving facilities are typical of the many highly specialized metallurgical techniques and equipment which CB&I has pioneered and put to work on structures that *work* rather than merely *serve.*

Such facilities point up the many "extras" you get when you specify CB&I . . . the engineering service and attention to metallurgical details that mean a *lot* in today's complex refining operations.

Write your nearest CB&I office for the brochure: *The Evolution of the Oil Storage Tank.*

CB&I

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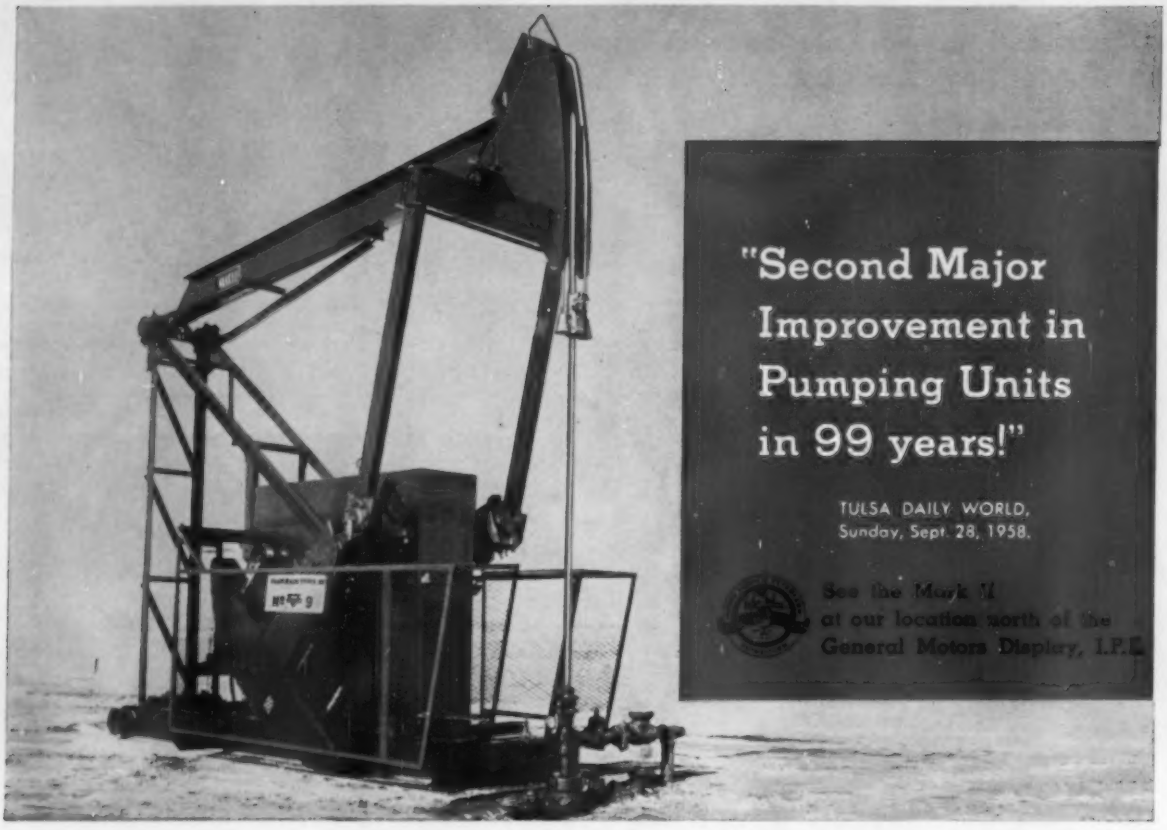
*for integrity in . . .*

Engineering . . .
Fabrication . . .
Erection

***Welded steel structures serve better and last longer with CB&I coordinated services.***

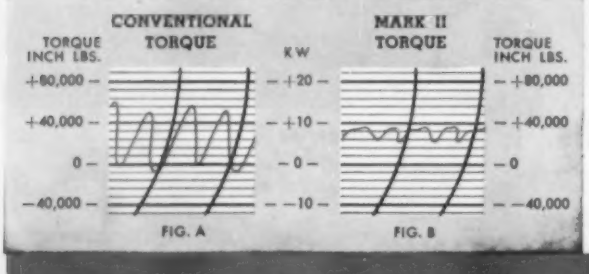
P81CB

**See the CB&I Exhibits at the I.P.E., Tulsa, and The World Petroleum Congress, New York**


"Second Major Improvement in Pumping Units in 99 years!"
TULSA DAILY WORLD, Sunday, Sept. 28, 1958.
See the Mark II at our location north of the General Motors Display, I.P.E.

# How the Mark II Unit Pumper
# CUTS PUMPING COSTS 20% and more

**UNITORQUE** is an exclusive advantage of the MARK II Unit Pumper that effects a more uniform torque demand and reduces peak torque requirements as much as 40%. This is brought about through a unique geometric arrangement and a phased counterbalance. Figures A and B show watt meter charts on turnabout comparison tests between a conventional pumper and a Mark II, pumping the same well under identical conditions. Figure A indicates that the conventional unit required a peak load of 14 KW, equivalent to 56,000 inch-pounds of torque. Figure B shows that the Mark II required only 9 KW at peak load, equivalent to 34,000 inch-pounds of torque, pumping the same well with the same motor. This adds up to a substantial reduction in peak torque that the reducer must deliver in order to lift a given load at the polished rod. The result is a major savings in speed reducer size, prime mover cost and in the cost of power.




**Quick, Easy, Semi-automatic Counterbalancing** — For the first time in the history of the industry, the pumper can, by simply moving a lever forward or backward, employ the unit's energy of rotation to reposition a portion of the counterweight. By this effortless adjustment of the counterweight to meet varying well load conditions, it is possible to eliminate "ninety percent"* of the mechanical failures of gears, pitmans, belts, bearings and shafts. Savings from the resulting reduced maintenance costs can be substantial.

**Sucker Rod Handbook No. 336, Page 169.*

**FOR COMPLETE INFORMATION about the MARK II Unit Pumper, write for descriptive literature.**

**OILFIELD EQUIPMENT CORPORATION** OF COLORADO
1730 FIRST NATIONAL BANK BLDG. • DENVER 2, COLORADO

EC

# They Say—

## Sun's true refinery runs

Dear Sir:

Please refer to pages 64 and 65, The Oil and Gas Journal, April 13, Vol. 57, No. 16.

Refinery crude runs (barrels daily) for 1958 and 1957 under Sun Oil, I believe are in error and should be 227,250 and 251,670. Someone pointed off wrong.

Cameron T. Smith
Waterville, Ohio

*(Editor's note: Reader Smith's figures are correct. Figures for Sun Oil's runs in the Journal table were one decimal point off.)*

## Getting to the bottom

Dear Sir:

In the April 20 issue, page 169, in your article on Magnolia's Hunton well, your map shows a line as the Anadarko Basin trough, which I suppose means the lowest points along this line of any marker with south dips to the north of it and north dips to the south of it.

However, Shell's No. 5 Rumberger in Elk City had Mississippian at 20,926, which is the lowest Mississippian logged in Oklahoma. I think you are bound to put the trough of the syncline through that well until it is proven to be wrong.

At Cement, Magnolia had Mississippian at 18,382, which should also be on the line.

Tom L. Coleman
Norman. Okla.

## Selling employes first

"Unless we convince our employes of the rightness of our position we cannot possibly succeed in getting solid public understanding of our industry, its merits, and its problems.

"And the conviction won't last with either the general public or the employe public without constant renewal. Telling a company story or an industry story is a perpetual job."

*Millard E. Stone, industrial relations vice president, Sinclair Oil Corp., in a speech to the National Petroleum Association, Cleveland.*

## It changed the world

"The industrial corporation, as we know it today, is a creature of technology just as certainly as the flying machine or the cotton gin, and it has proved the most effective device for extending technology which man has ever known.

"It was not until the twentieth century that the corporation came into wide usage as the structural form of large-scale organization. In this century, it has changed the world.

"It has provided a focal point for the development of technology, taking it out of the side-line class and making it a full-time profession. The corporation has brought to the support of technology an extraordinary number and variety of services and resources. In our own company, as an example, we have about 2,400 technically trained employes in research and development, assisted by more than 3,500 specialists and technicians. We spent $90 million last year to underwrite their work.

"All the facilities which can be mustered are employed to assist the research worker and make his effort more productive. No longer does he work in ignorance of what others are doing. Today, few developments throughout the world escape notice, for there is a constant interchange of information . . ."

*Henry B. du Pont, vice president of Du Pont Co., in the annual Edward G. Budd lecture of Franklin Institute, Philadelphia.*

## Foreign aid misunderstood

"In addressing the Economic Club of New York last October, Dr. Pedro Beltran, a leading Peruvian publisher and statesman, said in part: 'It amazes our people to see the length to which you can go (in aiding) far away countries with whom you have no particular ties and with whom you will never be able to develop the kind of family relationship that can become permanent in this part of the world where there exists a true community of interests.'

"This point is well taken and an appreciation of it is essential to a better understanding with Latin America. Obviously, we haven't succeeded in making clear the tremendous, if indirect, value such aid is to the entire Western Hemisphere.

"One of our objectives in making loans and grants to European countries has been to strengthen these countries in order that they may better protect themselves from the inroads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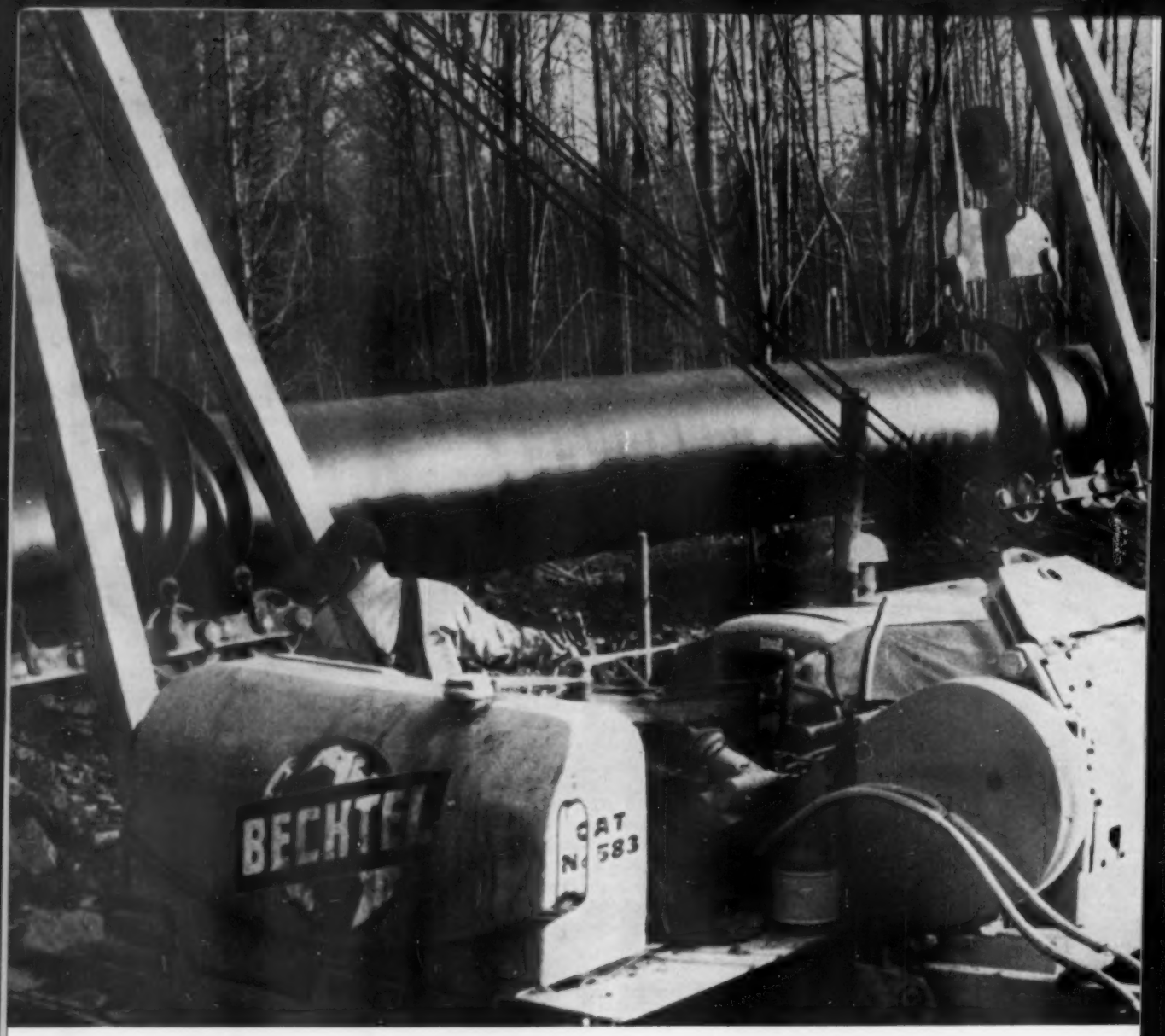


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At our Steelton, Pa., plant we have new facilities for cold-expanding electric fusion-weld pipe *18 to 42 in. OD.* And on our new mill at Sparrows Point, Md., we produce electric resistance-weld pipe from $5\frac{9}{16}$ in. to 16 in. OD *in lengths to 60 ft.*

For top economy in every phase of pipe line construction and operation, use Bethlehem Steel Line Pipe. Let our nearest sales office quote on your requirements.

| | SIZES (in., OD) | WALL THICKNESS (in.) | LENGTHS | SPECIFICATIONS |
|---|---|---|---|---|
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| **ELECTRIC RESISTANCE-WELD** | 5 (nom) to 16 | API | to 60-ft | API 5L, Grades A & B<br>API 5LX, Grades X42 & X46 |
| **CONTINUOUS BUTT-WELD** | ½ to 4 (nom) | API | SRL 24 to 26-ft<br>DRL to 50-ft | API 5L |
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On your next well, try Seeco-Mul Drilling Mud Emulsifier as an extreme pressure additive. Many operators have recently discovered this extra advantage in Seeco-Mul; in fact we can show you data on a number of field wells drilled under almost identical conditions that will convince you that Seeco-Mul is the most effective E-P agent you can use.

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In addition to the E-P qualities, you get many other advantages with Seeco-Mul. Inasmuch as Seeco-Mul is a chemical emulsifier with superior wetting abilities, it is often run in so-called "soap" drilling fluids (the addition of detergents to fresh water muds, oil-and-water, and water-clay systems) to lower the surface tension, thereby wetting the formation ahead of the bit and keeping the bit clean. Such systems also afford a faster penetration rate and aid the suspended solids to drop out in the pits.

Too, with good lubricating qualities in the mud, less drill stem torque is required, pump pressures can be lowered and more evenly sustained, and a higher velocity of the fluid on bottom can be obtained . . . all of which means longer service life for liners, collars, tool joints, drill pipe, and the bits themselves.

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Let us show you how you can use Seeco-Mul profitably. We'll gladly send you illustrated literature and a lab sample of Seeco-Mul, or contact your local mud dealer. You can get full particulars without obligation.

[1]*McCutcheon, John W., "Synthetic Detergents."*

***Make a good mud better...use***

**CROSSETT Seeco-Mul DRILLING MUD EMULSIFIER**

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*Seeco-Mul is the dried flake form of a compound of the sodium salts of abietic, linoleic, and oleic acids, together with quantities of wood tannins and lignins.*


of communism. In so doing we are helping protect the Western Hemisphere from communism, Latin America as well as the United States.

"Then, too, as these European countries become stronger, they are in a position to purchase goods from other countries, thus serving as a stimulant to the economies of all the nations of the Western Hemisphere.

"Dr. Beltran's statement reminds us, too, that we have failed to make clear our essential viewpoint about aid to foreign countries—which is that, wherever it is at all possible, self-help combined with private foreign investment will play the most effective role in the economic development of a country.

"In a number of countries nationalistic feelings have restricted private investments. While nationalism is a good thing, there is the need to convince our neighbors that an excessive spirit of nationalism, which may prevent foreign capital from participating in the development of basic resources and in basic industrial projects, works to the detriment of a country and its people."

*Michael L. Haider, director, Standard Oil Co. (N. J.) in a speech at the University of Miami.*

## Advice only, please

"Because of the many diverse interests involved, it would seem that a satisfactory national energy policy for Canada can be achieved only with the full cooperation of all levels of government in working out a mutually satisfactory solution in areas of possible conflict between federal and provincial authorities.

"The function of a National Energy Board should be purely advisory, compiling data and making recommendations to the federal Government with respect to the utilization of this country's energy resources in the best interest of the Canadian people."

*E. D. Loughney, Sr., vice president, British American Oil Co., Ltd., in a speech to the Saskatchewan division of the Canadian Petroleum Association.*

**Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.**

# CALENDAR

**MAY**

**4-5** American Society of Mechanical Engineers, maintenance and plant engineering division conference, Edgewater Beach Hotel, Chicago.

**4-5** Independent Petroleum Association

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International Petroleum Exposition

MAY 14-23, 1959
Tulsa, Oklahoma

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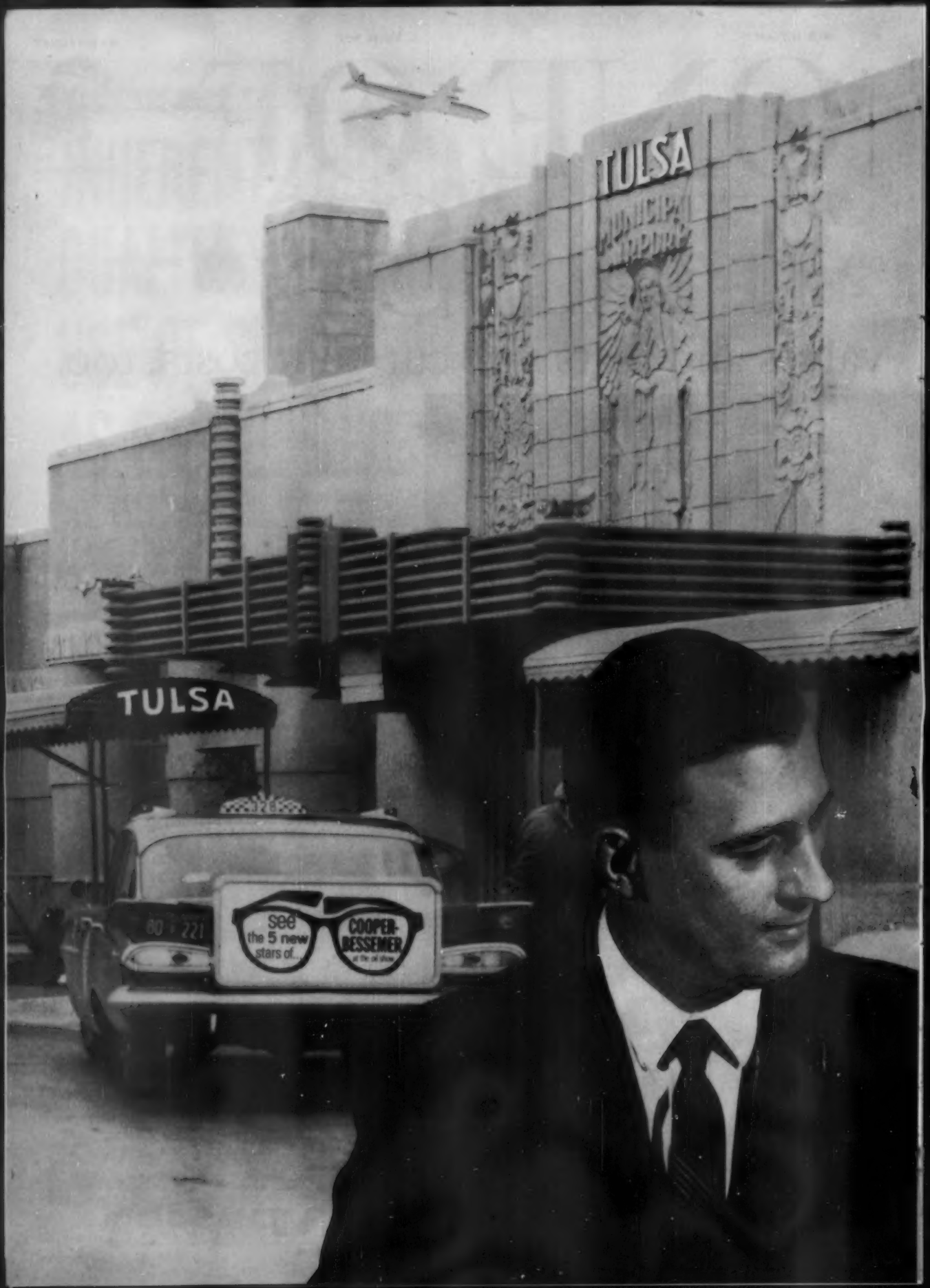
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Stanley E. Johnson, *Vice President and Director of Sales,*
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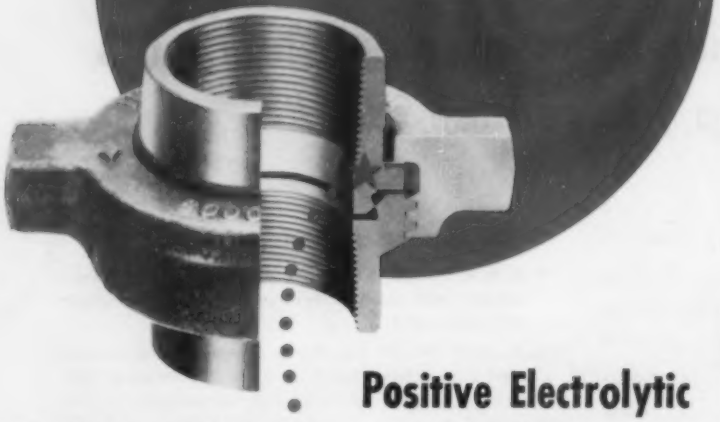

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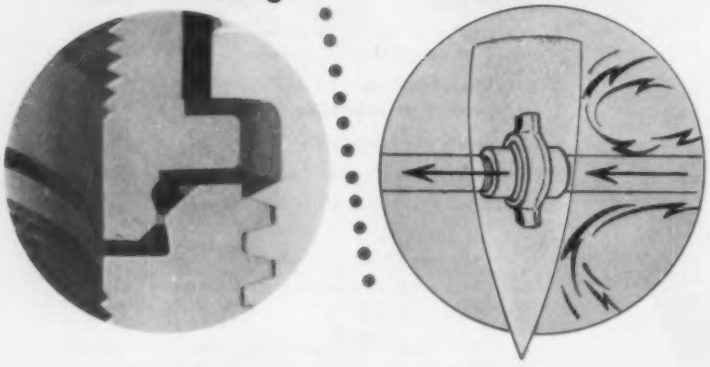

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of America, midyear meeting, Westward Ho Hotel, Phoenix.

**4-7** American Geophysical Union, annual meeting, Washington.

**5-7** Purdue University, fourteenth Purdue industrial-waste conference, Purdue Memorial Union Building, Lafayette, Ind.

**6-7** Panhandle Producers and Royalty Owners Association, annual meeting, Amarillo, Tex.

**6-8** American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

**7-8** Rocky Mountain Oil and Gas Association, refining committee annual meeting, Petroleum Club Building, Denver.

**7-8** Society of Petroleum Engineers of AIME, Permian Basin section oil recovery conference, Midland, Tex.

**10-12** Industrial Security Institute, third annual industrial mutual aid and disaster control conference, Baton Rouge, La.

**13-15** American Petroleum Institute, Division of Transportation, annual pipeline conference, Pittsburgh.

**13-15** Canadian Institute of Mining and Metallurgy, tenth annual technical meeting of the Petroleum and Natural-Gas Division, Macdonald Hotel, Edmonton.

**14-23** International Petroleum Exposition, Tulsa.

**17-20** Society of Petroleum Engineers of AIME and American Institute of Chemical Engineers, joint symposium on chemical aspects of oil production, Muehlbach Hotel, Kansas City.

**21-22** European Federation of Chemical Engineering, annual meeting, Frankfurt, Germany.

**22-24** Illinois Geological Society, third field trip, southeastern Illinois, headquarters-Illinois Country Club, Harrisburg, Ill.

**25-27** Chemical Institute of Canada, forty-second annual conference, Halifax, N. S.

**25-27** American Society for Quality Control, annual convention and exposition, Public Hall and Hotel Sheraton Cleveland, Cleveland.

**25-28** American Society of Mechanical Engineers, machine-design division, design-engineering conference, and Clapp & Poliak, Inc., design-engineering show, Convention Hall, Philadelphia.

**27-29** American Petroleum Institute, Division of Marketing, midyear meeting, Savery Hotel, Des Moines.

**27-29** Southern Gas Association, fourteenth annual short course in gas technology, Texas College of Arts & Industries, Kingsville, Tex.

**27-30** American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, New York.

**30-June 5** Fifth World Petroleum Congress, Coliseum, New York.

**JUNE**

**2-4** Appalachian Underground Corrosion Short Course, University of West Virginia, School of Mines, Morgantown, W. Va.

**4-5** Kentucky Oil and Gas Association,

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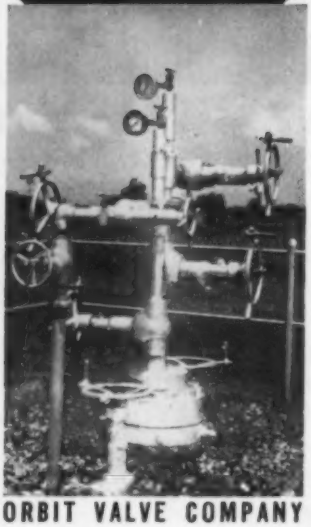

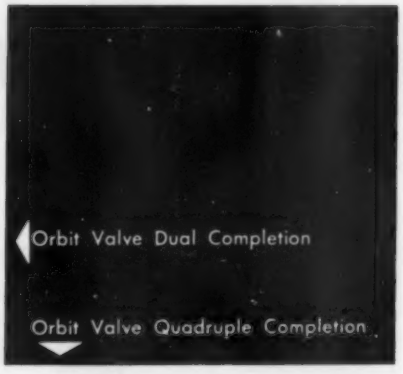


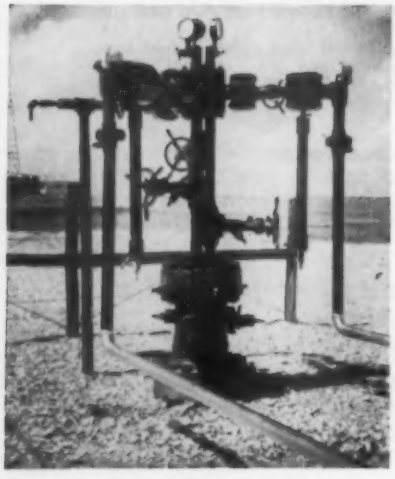

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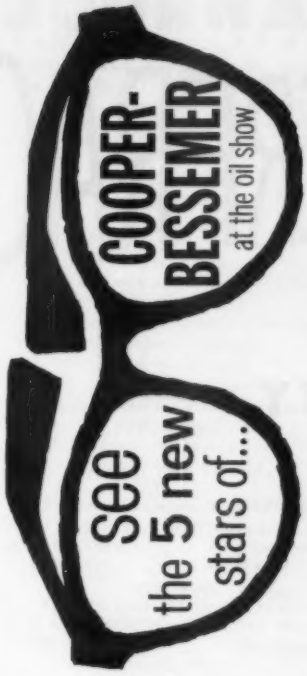




annual meeting, Phoenix Hotel, Lexington.

8-9 University of Michigan, School of Public Health and College of Engineering, short course on industrial water conservation, Ann Arbor, Mich.

10 American Association of Oil Well Drilling Contractors, tristate chapter, annual safety clinic, Carmi, Ill.

10-12 Instrument Society of America, second international symposium on gas chromatography, East Lansing, Mich.

10-13 American Association of Petroleum Landmen, fifth annual convention, Skirvin Hotel, Oklahoma City.

11-12 Southern Research Institute, conference on "The Undiscovered Earth," Birmingham, Ala.

14-18 American Society of Mechanical Engineers, semiannual meeting, Chase and Park Plaza Hotels, St. Louis.

14-19 Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City.

15-17 Interstate Oil Compact Commission, midyear meeting, Roosevelt Hotel, New Orleans.

21-26 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City.

22-23 Michigan Gas Association, Grand Hotel, Mackinac Island, Mich.

22-24 Canadian Gas Association, annual meeting, Empress Hotel, Victoria, B.C.

22-26 Air Pollution Control Association annual meeting, Statler-Hilton Hotel, Los Angeles.

22-26 Gordon Research Conferences, petroleum, Colby Junior College, New London, N. H.

22-26 Massachusetts Institute of Technology, National Association of Corrosion Engineers, short course on fundamentals of corrosion reactions and corrosion control, MIT, Cambridge, Mass.

24-25 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting Broadview Hotel, Wichita.

29-July 3 Gordon Research Conferences, catalysis, Colby Junior College, New London, N. H.

JULY

6-15 University of Michigan, short course on underground storage of natural gas, Ann Arbor, Mich.

16-17 University of Michigan, research conference on underground storage of natural gas, Ann Arbor, Mich.

27-31 University of Minnesota, continuation course, techniques of chemical infrared spectroscopy, Minneapolis.

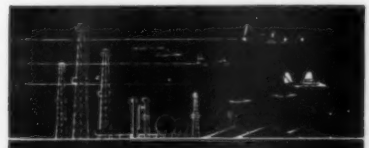
AUGUST

3-7 University of Minnesota, continuation course, chemical interpretation of infrared spectra, Minneapolis.

10-13 Society of Automotive Engineers, national West Coast meeting, Hotel Georgia, Vancouver, B. C.

12-15 Billings, Mont., Geological Society, tenth annual field conference, Disturbed Belt area of northwestern Montana, registration, August 12, Great Falls, Mont.

26-28 Pennsylvania Grade Crude Oil Association and Pennsylvania State University, twenty-first technical conference on petroleum production, Penn State campus, University Park, Pa.

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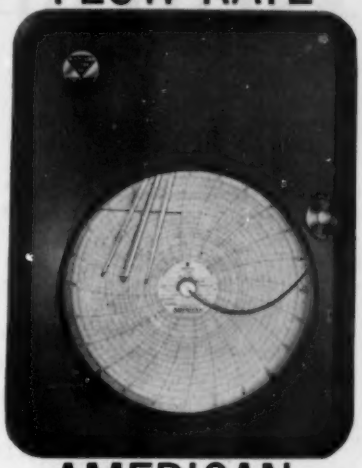

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# JOURNALLY SPEAKING

## Attitude of Altitude

GOV. JOE J. HICKEY of Wyoming has a peculiar view toward taxes for a man who is the elective head of his state. He believes in holding the line on taxes. In fact, he is insisting that Wyoming's state economy be pegged to no tax increases.

Hickey's view is a breath of fresh air that seldom blows in many state capitals.

He made his views crystal clear recently while addressing a meeting in Casper of the Rocky Mountain Oil and Gas Association.

"I believe this state can exist without additional taxes," the governor told the oil men. "And I'd like your assistance in helping keep me an honest man."

Oil operators in Wyoming discovered early in Hickey's term as governor that he isn't just paying lip service to his program to keep a lid on taxes. He was instrumental in killing a proposal to slap a severance tax on oil and gas. And he left no doubt he plans to keep the industry free of a severance tax as long as he is governor of Wyoming.

Hickey, who started his 4-year term in January, admits his hold-the-line program is not simple to carry out.

"It is like putting the contents of a quart bottle in a pint bottle," he said.

Why is Hickey holding the line on taxes? He says primarily he wants to encourage industry to move into his state. He also cites figures that substantiate his stand.

He says Wyoming's population has increased only 5% in the past 12 years. During the same period, the state's budget has soared slightly more than 500% to about $40,000,000 a year. The small increase in population doesn't justify any bigger increase in state spending, Hickey says.

It is true that many growing states couldn't adopt such a program. But if the governors of several oil-producing states soaked up some of Hickey's thinking, the industry would fare much better than it has in the past.

THE GOVERNOR of Wyoming is just one of many people with a refreshing view whom you meet in a swing through the Rockies.

Bruce Anderson, a Denver independent, is a good example of the energetic oil man you find in the region these days. Anderson holds leases in most of the oil-producing states and is always ready to talk a deal of some kind.

Anderson explains his situation this way: "Every morning when I get up, I know I'm worth a little less than I was the day before because some of the oil I own has been produced."

"Being worth a little less" today than yesterday is a good enough excuse for any oil man to be on the hunt for a deal. Incidentally, this is also a good point that can be developed if you ever need to explain why the oil industry needs a 27½% depletion allowance.

A VISIT to the office of Colorado Oil & Gas Corp. in Denver is also a refreshing experience.

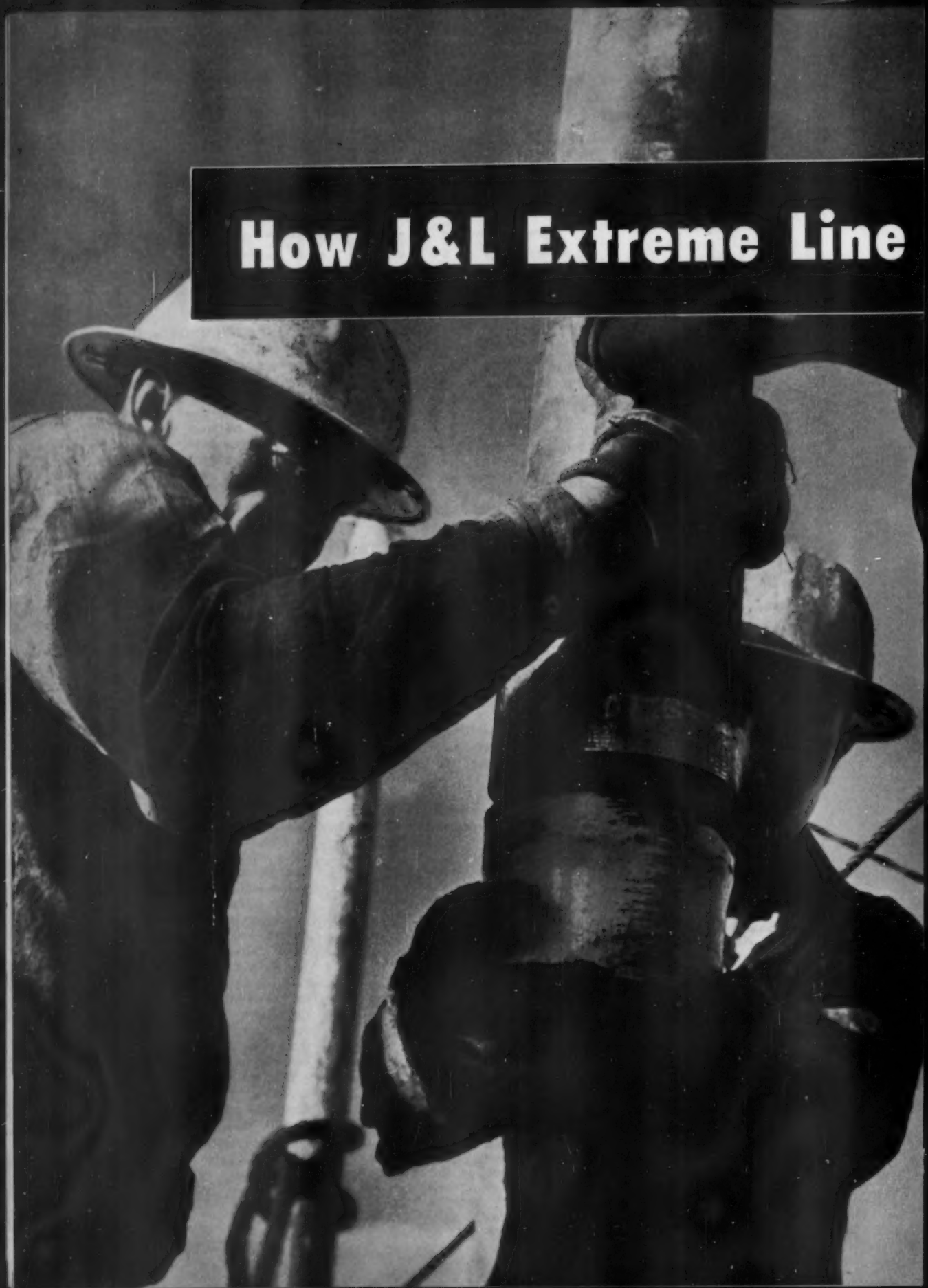
Colorado is a company that has integrated backwards. The company started out in the natural-gas-pipeline business. It acquired some gas production in the process of growing. As a result of the gas production, it also picked up some oil production.

Just within the last couple of years, it has added Derby Refining to its operations and a few months ago got into the crude-oil-pipeline business by a half interest in Jayhawk Pipeline.

And today Colorado is ready to take on just about any kind of deal the oil industry has to offer. Among the ventures being undertaken by the company is the job as operator for a three-company combine looking for oil along the southern coast of Alaska.

It might be the altitude that is responsible for the attitude of Rocky Mountain oil men. But my guess is that the same spirit that has sparked oil men throughout the past 100 years is still very much alive in the Rockies today.

*—Carl J. Lawrence.*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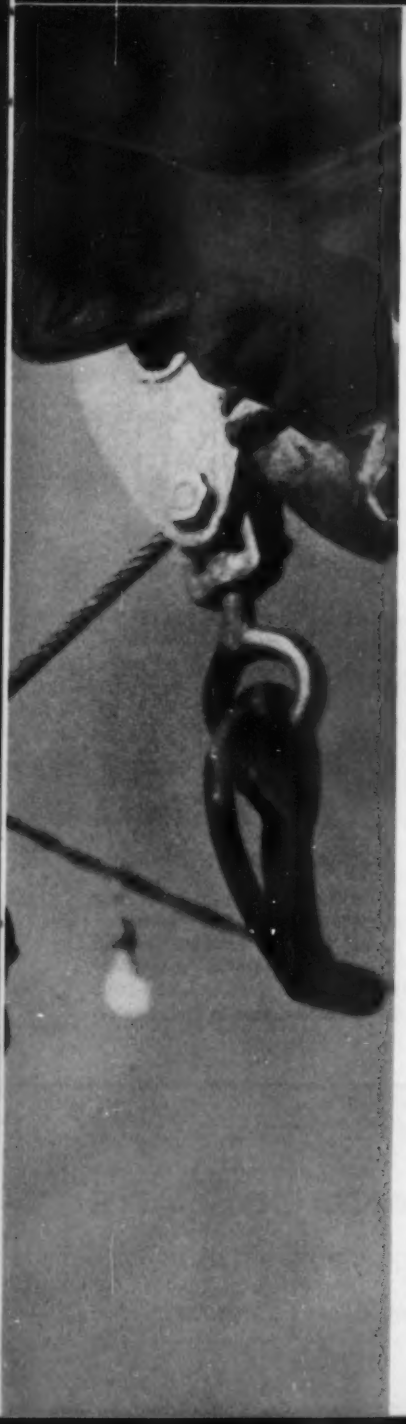

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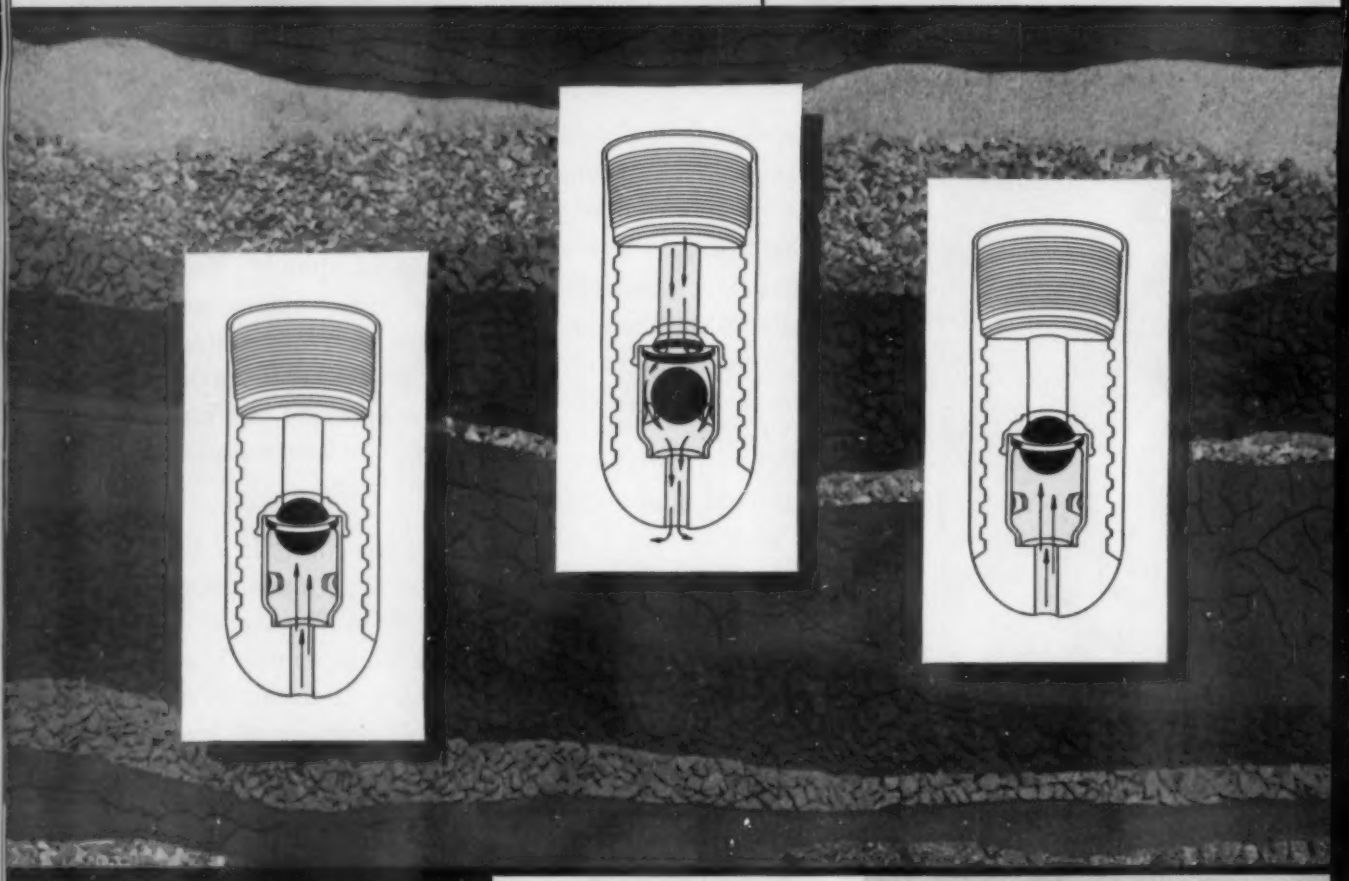

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# Separate the wells, not the industry

THE PRODUCING BRANCH of the oil industry is in danger of being split by a bitter internal war over something that nearly everyone agrees is a desirable objective.

The objective is to reduce costs and improve general efficiency by a program to modify a number of competitive practices and obsolete methods which experience has shown to be wasteful.

But many independent producers are kicking up a big storm—not over the announced objectives but over what they imagine may be unannounced objectives or unintended results.

WIDER WELL SPACING is the first but by no means the only objective of this movement which is fostered by a loose and informal group calling itself the Oil Conservation Forum. It is the point that is drawing the most fire at the moment.

There is virtually unanimous agreement that very often more wells are drilled than necessary to recover the oil in a reservoir, and that this is uneconomic. So the objective is to have state regulatory bodies foster wider spacing patterns in the initial development of a new field, at least until reservoir studies indicate the need for infill drilling.

But objectors are looking under the bed and seeing all kinds of horrid bogeymen there. They raise fears of "inordinately" wide spacing some time in the future. They sound the alarm that royalty payments might be delayed for years. They suggest that this might become a tool by which the majors could freeze out independents. And there is even a hint that it may all be a plot by importers to wreck the U. S. industry.

In Texas there is a terrific furor over pooling all surface rights within a spacing unit—whether the unit be 10 acres or 160. This seems pretty silly to operators in the other big oil states which have had pooled drilling units for a generation and with no friction whatever.

The issue is also being befuddled with arguments over proration formulas, discovery allowables, leasing practices, and other things which have no direct bearing on the engineering problem of locating wells to get the maximum recovery.

A HEALTHIER DOMESTIC INDUSTRY is the objective of the Conservation Forum. If this can be achieved it will benefit everybody—independent producers, royalty owners, drilling contractors, and the public.

Short-sighted and selfish criticisms of the rational and mild first steps toward gradually widened spacing patterns are endangering the success of other aspects of the objective.

Obviously some dispassionate educational and missionary work needs to be done within the industry. When the false fears and misunderstandings have been dispelled, any deliberate misrepresentations will show up for what they are.

*(Advertisement)*

# How to get the most from your visit to the Oil Show

1. Make a list of the equipment and services in which you are interested.

2. Make a schedule of general-interest activities and company functions that you wish to attend.

3. Have a good map of the show grounds and use it as a check list of the exhibits you must visit.

A half million attendance is expected for the '59 Oil Show

The oil show will be big.

There are dozens of streets, hundreds of exhibits, and people, people, people. If you wander around the exposition grounds long enough, you might see some of the exhibits you are looking for—if you have lots of time and a built-in radar set.

The Journal folks put their heads together to try to solve this problem for their friends who will be visiting and exhibiting at the show.

"What we need," someone remarked, "is a way to tell visitors which of those 650 booths are showing the things he's most interested in."

Turned out there IS a way to do just that—an electronic IBM "brain" that stores up hundreds of categories and spews them out at the touch of a button. The machine is fed by a system of cards which the Journal is preparing.

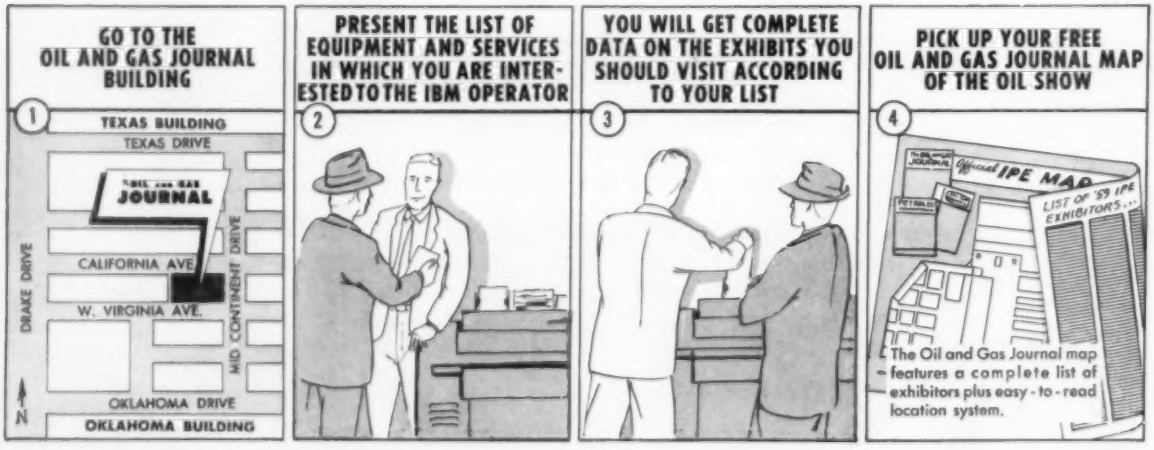
Here's how it works:

A visitor comes through one of the entrances. Before he does another thing, he comes directly to the Journal booth (the map at bottom left shows how to get there). At the booth, he tells the IBM operator just what subjects he is interested in. He can be as specific as he wants. Not just "valves," for instance, but "butterfly valves."

The IBM operator feeds the request into the machine; it then produces a complete list of manufacturers which are actually showing butterfly valves at the show.

The Journal will also supply the visitor with a specially prepared large-size map that shows every exhibit on the exposition grounds, and with which he can go directly to the booths having the butterfly valves on display. The whole service is provided free by the Journal to oil men and their friends when they visit the show.

So the thing to remember as you step through the entrance gates to the exposition is this: Go to the Journal building—first!


GO TO THE OIL AND GAS JOURNAL BUILDING
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TEXAS BUILDING
TEXAS DRIVE
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DRAKE DRIVE
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N
OKLAHOMA BUILDING
PRESENT THE LIST OF EQUIPMENT AND SERVICES IN WHICH YOU ARE INTERESTED TO THE IBM OPERATOR
2
YOU WILL GET COMPLETE DATA ON THE EXHIBITS YOU SHOULD VISIT ACCORDING TO YOUR LIST
3
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4
Official IPE MAP
LIST OF '59 IPE EXHIBITORS...
The Oil and Gas Journal map features a complete list of exhibitors plus easy-to-read location system.

## A First-Quarter Look at Oil

| | Gross Income ($ millions) | | | Net Income ($ millions) | | | Refinery Runs (Thousands B/D) | | | Crude Production (Thousands B/D) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1959 | 1958 | 1957 | 1959 | 1958 | 1957 | 1959 | 1958 | 1957 | 1959 | 1958 | 1957 |
| Standard Oil (N. J.) | 2,018 | 1,890 | 2,043 | 167 | 146 | 237 | 2,875 | 2,400 | 2,493 | 2,589 | 2,266 | 2,405 |
| Gulf Oil Corp. | .... | .... | .... | 67 | 61 | .... | 662 | 704 | .... | 1,286 | 1,181 | .... |
| Socony Mobil | .... | .... | .... | 45 | 37 | .... | 953 | 846 | .... | 757 | 722 | .... |
| Texaco, Inc. | .... | .... | .... | 91 | 70 | .... | .... | .... | .... | .... | .... | .... |
| Standard (Ind.) | .... | 479 | 556 | .... | 31 | 46 | 647 | 631 | 690 | 317 | 283 | 320 |
| Shell | 452 | 410 | .... | 34 | 31 | .... | 475 | 446 | .... | 321 | 289 | .... |
| Phillips | 300 | 262 | 296 | 26 | 21 | 28 | 220 | 223 | 252 | 224 | 207 | 226 |
| Sinclair | 337 | 326 | 350 | 17 | 15 | 26 | 439 | 422 | 443 | 191 | 191 | 174 |
| Cities Service | 280 | 287 | 306 | 13 | 13 | 23 | 279 | 243 | 279 | 152 | 130 | 144 |
| Atlantic Refining | 155 | 145 | 170 | 12 | 3 | 15 | 206 | 190 | 201 | 135 | 115 | 120 |
| Sun Oil | 203 | 169 | 208 | 11 | 6 | 13 | 253 | 239 | 251 | 131 | 107 | 131 |
| Continental | 165 | 156 | 170 | 14 | 11 | 14 | 169 | 160 | 157 | 169 | 142 | 159 |
| Union | 100 | 97 | 108 | 5 | 6 | 9 | 162 | 159 | 170 | 92 | 100 | 105 |
| Skelly Oil Co. | 69 | 64 | .... | 7 | 6 | .... | 53 | 51 | .... | 67 | 63 | .... |
| Ohio Oil Co. | 75 | 72 | 78 | 10 | 8 | 13 | 45 | 43 | 43 | 112 | 98 | 114 |
| Sunray Mid-Continent | 99 | 89 | 99 | 10 | 10 | 12 | 116 | 101 | 108 | 85 | 81 | 91 |
| Standard (Ohio) | 92 | 89 | .... | 9 | 4 | 8 | 145 | 136 | 145 | 35 | 32 | 37 |

# Profits Picture Brightens for Oil

**• Earnings for first 3 months of 1959 are up sharply over last year but still below 1957 levels. Better outlook stems from increased demand for products, especially gasoline, and stepped up operating rates.**

OIL COMPANIES have made a fast getaway toward one of their most profitable years.

First-quarter earnings, now being announced throughout the industry, reveal that oil is staging a strong recovery from last year's recession. They show, with only few exceptions that:

. . . **Profits** are up sharply from 1958 but still below 1957 levels.

. . . **Demand,** especially for gasoline, is strong and profit margins have improved.

. . . **Operations,** such as refinery runs and crude production, also have picked up.

Some of the first-quarter earnings are on the spectacular side. Texaco, Inc., for instance, reported a 30% gain in earnings during the first 3 months compared with the same period last year. They are the highest of any first quarter and the second highest of any quarter in Texaco's history.

Atlantic Refining showed one of the best increases in earnings. Its net profits reached $11.9 million in the first quarter compared to only $2.7 million last year. Sun Oil nearly doubled its earnings—from $6.1 million last year to $11.2 for this year's first quarter. Gains in earnings of from 20% to 25% were commonplace.

Sinclair's first-quarter sales set a company record for any quarter, exceeding 2 billion gallons for a 3% gain over the same period last year. Its gasoline sales also were the highest for any first quarter.

Phillips registered a 7% gain in sales volume of all petroleum products and a 10% rise in sales of automotive gasoline. With gasoline prices improved, this sales volume gave Phillips' income a shot in the arm.

Jersey Standard reported its product sales volume up 11% over the first quarter of last year. The company, however, noted that crude and product prices, particularly abroad, continue to show weakness.

As evidence of the strength of the oil business, Gulf reported a $6-million gain in profits in spite of a 35-day strike during the first quarter at its giant Port Arthur, Tex., refinery. The strike shaved Gulf's refinery-run volume, but the company posted a gain in crude production.

**Why the upswing . . .** Oil executives declared in their reports to stockholders that the good first-quarter stemmed from:

. . . **Increased volume** of product sales.

. . . **Higher production** rates for crude and natural-gas liquids.

. . . **Reduced expenses** despite a 5% wage increase.

. . . **Improved profit margin** on product sales.

Cold weather at the first of the year which moved heating oils and a generally strong gasoline demand throughout the first quarter helped give product sales their big boost.

Many companies with refining facilities mentioned that better profit margins on product sales boosted gross income. This profit-margin improvement occurred when product prices firmed and crude prices generally sagged. Some oil men think both

product and crude prices are still nothing to cheer about.

At least two companies—Phillips and Gulf—made special note of the beneficial results of tighter cost controls. Phillips declared it had reduced costs even after granting a general 5% wage increase. Gulf predicted that its vigorous cost-control program initiated last year would pay off in better earnings throughout 1959.

**Unusual activities . . .** Payoffs on foreign investment are beginning to be felt broadly through the domestic oil industry.

One Gulf official said "there has never been a time when so much oil exploration was under way in foreign regions as at present."

He added that the objectives of future long-range supply and alternate sources are being realized. He predicted this widespread occurrence of crude oil supplies may tend to lessen political pressures the industry has felt in recent years.

Phillips reported that two more producers, each testing in excess of 6,600 bbl. daily, have been completed on Lake Maracaibo tracts held by a group of companies with Phillips as the operator. Crude oil from the operations is now being transported and sold.

Ashland, a member of the Phillips group, also reported their entire 25,000-acre Venezuelan concession held in Monagas probably will be productive based on six producers completed. Estimates put 9 billion barrels of oil in place with recoverable reserves calculated at about 600 million barrels. The crude is a low gravity, asphaltic type.

Texaco reported its exploration and producing operations in this country are at an all-time high. It noted significant discoveries in Louisiana in Terrebonne Bay fields and offshore south of Marsh Island. Other companies made special note of activities in Mississippi, Louisiana, Texas, the Rockies, and western Canada.

The outlay for capital investment and exploration probably will slightly exceed last year if first-quarter operations hold through the year.

Texaco expects its 1959 outlays to reach $515 million, about the same as last year. Jersey Standard's capital and exploratory spending for first quarter was estimated at $200 million, down from the $252 million spent in the same quarter last year. Gulf expects its capital outlays to exceed the $510 million spent last year.

Research spending also is getting special emphasis at Texaco. The company in 1959 will spend more than the record $20 million budgeted for research last year. Texaco President James W. Foley said this research already has paid off in:

**. . . Shale-control mud** which prevents collapsing clay formations from filling in drilling holes.

**. . . Selective finishing process**—a molecular-sieve method for separating petroleum into its components.

**. . . Lead appreciator** that increases the antiknock qualities of leaded gasolines.

Sun Oil made special mention of the benefits from custom blending gasoline at the pump.

Sun Chairman Joseph N. Pew, Jr., said " . . . it appears that we have been increasing our gasoline sales approximately twice as fast as have our competitors since July of last year. So far this year, we are continuing to improve our sales volume at a rate somewhat above that of our competitors."

He added: "We believe that this major marketing innovation is continuing to win the favor of the motoring public both as the one complete answer to providing a proper octane requirement for every car and also as a means of providing the motorist with real economy."

**The outlook . . .** Oil executives almost to a man declared they felt the increased earnings foreshadowed a good year.

Increase in demand for the year throughout the free world is predicted. The increase is estimated at from 6 to 8% world-wide and 3.5-4% domestic.

Other comments ran like this: Conditions favorable for rest of the year . . . General outlook is good . . . Income from foreign production is picking up . . .

At the same time, the company leaders informed their stockholders of these disturbing clouds in the otherwise fair business sky:

**. . . Inflation** is still a threat, especially to oil where prices always don't move in relation to costs.

**. . . Need for restraint** in demands of labor leaders.

**. . . Product prices** better but still too low and don't reflect rising operating costs.

**. . . Attitudes of government** agencies in investigating large corporations.

**. . . Heavy taxes.**

One Gulf spokesman declared it was surprising how few persons realized that petroleum is one of the most heavily taxed of all industries. He said Gulf paid some $638 million last year in taxes—or 20 cents out of every $1 taken in.

Socony Mobil pointed out that it earned $70.3 million before U. S. and foreign income taxes. These levies alone, however, cut net earnings to $45.2 million.

# Failures Are

**• Dry holes are jolting town-lot drilling. Only one area is successful.**

THE SCRIPT for oil play in metropolitan Los Angeles apparently calls for oil strikes on the west side movie lots but dry holes over the rest of town.

This is becoming more apparent from the results of drilling ventures in residential areas launched with great optimism a few months ago.

The successes have been restricted to the 20th Century Fox movie lot and an area just to the south. Hopes are still held for strikes on the MGM and Desilu acreage in Culver City.

Failures have mocked drilling efforts in the center of the old Los Angeles City field and at some of its fringes, in the central Los Angeles residential district, in old Salt Lake field area, at the Los Angeles Country Club, and on the Paramount movie lot in Hollywood.

**Bright spot . . .** The west Los Angeles area around the now largely abandoned old Beverly Hills fields is the only bright spot at present.

Main attraction is the highly successful operations of Universal Consolidated Oil Co. on the 20th Century Fox movie lot on the edge of Beverly Hills. Since the discovery well in 1954, Universal has drilled 24 wells on the property. They now are producing about 2,000 bbl. daily from several zones under choke.

Two golf courses and community leases just south of Universal's wells also have enjoyed strikes. These have been a joint venture of Signal Oil & Gas Co. and Richfield Oil Corp. with Signal as operator. The wells have all been drilled as "tight holes" and are now reportedly shut in pending completion of producing facilities.

Several miles south of this play, Continental Oil Co. plans a drilling campaign on the MGM and Desilu lots. Operations are being delayed pending approval of Culver City officials of drilling permits.

One black mark on the west Los Angeles activity has been failure of Hudson Gas & Oil Corp. to hit with three wildcats on the Los Angeles Country Club. It joins the Universal Consolidated production on the north.

Hudson tried with wildcats of 5,515

# Mocking Los Angeles Oil Search

## Los Angeles Drilling at a Glance . . .

### Failures

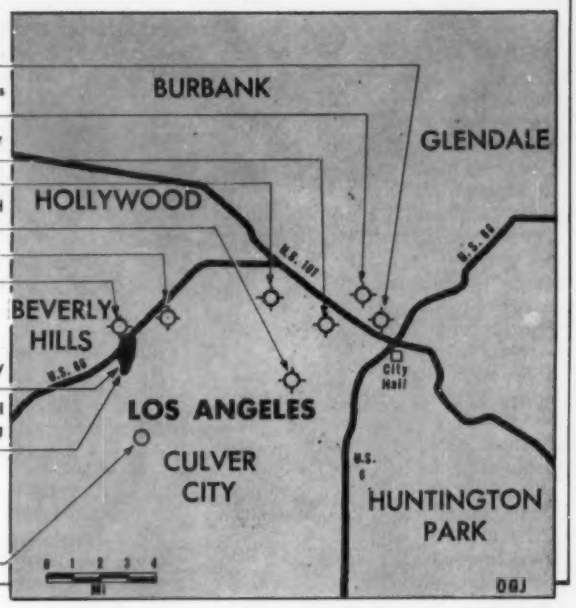
- Burke-Bauman: One dry hole in center of old Los Angeles City field.
- Richfield: One dry hole in Silver Lake area on fringe of Los Angeles City field.
- Guiberson & Burke: Two dry holes on west edge of Los Angeles City field.
- Union: One dry hole on Paramount lot in Hollywood.
- Union: Two dry holes in central Los Angeles. Last major undrilled indicated structure.
- Morgan Brown: One dry hole in old Salt Lake field area.
- Hudson: Three dry holes on Los Angeles Country Club.

### Successes

- Universal Consolidated: Twenty-four completed wells on 20th Century Fox lot.
- Signal-Richfield: Several tight holes drilled south of Universal Consolidated's wells. Wells shut in pending completion of producing facilities.

### Hopeful

- Continental: Plans to drill on MGM and Desilu lots in Culver City.




ft., 8,121 ft., and 9,367 ft. Company announced only last week that it still planned at least two more core holes on the private golf club property.

**Singing the blues . . .** The drilling operations in other areas of Los Angeles have provided a sad song.

The score by regions:

**. . . Los Angeles City field.** Richfield just abandoned an 8,045-ft. wildcat drilled on a 558-acre town-lot district located less than 4 miles west of the city hall on Sunset Boulevard in the Silver Lake district.

This was a test for deep production on the fringe of the old Los Angeles City field. It failed to find anything either at depth or in the intervals productive in the city field. This was a very costly operation for Richfield involving extensive soundproofing and electrification of all phases of the drilling.

"The company will study results of this test before we make any decision regarding another try," a Richfield spokesman said without much enthusiasm for the future of the area.

In addition to Richfield's miss at Silver Lake, Burke-Bauman Co. missed with a 4,858-ft. test in the center of the old field about 2 miles east of city hall. Guiberson & Burke also drilled two dry holes on the west edge of the field. The three tests reportedly cost a total of $2,000,000 and have discouraged the companies from further ventures in the field.

**. . . Central Los Angeles.** Union Oil Co. here has walked away from one of the most elaborate and expensive drill sites ever used in town-lot drilling (OGJ, Feb. 9, p. 68). Union's two tries to find production on the city's last undrilled indicated structure failed at 5,734 ft. and 9,663 ft. Union may try again within a year from a site approximately 1 mile west of its present site.

**. . . La Cienega.** Morgan Brown, one of the first to enter the search for deeper production around the older fields in residential parts of Los Angeles, has suspended operations. His wildcat halted at 10,152 ft. Brown had kept this project going several years. Location was on the west edge of the old Salt Lake field discovered in 1902, but now on the city's famous restaurant row, La Cienega Boulevard.

**. . . Hollywood.** Interest in this area is practically zero.

Reason is Union's miss with a 5,339-ft. hole drilled on the Paramount movie lot in the center of the film capital. Target of this wildcat was deep production in the general area of the old Salt Lake field. Union's drilling district included the neighboring RKO lot and also contained seven old wells still making a total of 200 bbl. daily.

**Why the effort? . . .** Why have oil men gone to all this expense and trouble to hunt for oil in such a thickly populated region? They were highly optimistic of striking some big pools. Back of this optimism were:

**. . . Three old oil fields** in the city which hadn't been explored in deeper horizons before residential development engulfed them.

**. . . Experience** elsewhere in the Los Angeles Basin where shallow fields nearly always later yielded to deeper discoveries.

**. . . Acceptance** of town-lot drilling because of advances in the art of soundproofing and landscaping rigs and sites.

As a result, a couple of years ago oil companies turned loose their landmen in residential areas of the city. Property owners were signed up in droves.

As it has turned out, except for one area of west Los Angeles, the search for new oil in the city has been a bust.

# Canada, Mexico to Get Import Favors

- Venezuela miffed by "discrimination" against countries dependent on ship movement of oil. It's also annoyed at being excluded from talks preceding decision to grant special treatment to Canada and Mexico.

THE DIKE erected by President Eisenhower against foreign oil is about to spring some leaks.

In the face of mounting opposition to oil-import controls, the President relaxed the barriers against Canadian and Mexican oil.

Effective June 1, crude oil, unfinished oils, and products will be exempt from quota if they enter the United States "by pipeline, rail or other means of overland transportation" from the country in which they were produced.

The exemption will apply to unfinished oils and finished products only if they are derived from crude oil which qualifies for entry without quota under the new proclamation.

Until June 30, the oil permitted to enter quota free will be in addition to the over-all volume now allowed. After June 30, the authorized level of imports into District 5 will be reduced to offset the amount coming in quota free.

In issuing the proclamation the White House announced that conversations will continue with Venezuela and other countries in the Western Hemisphere. The talks will be directed "toward a coordinated approach to the oil problem as it relates to defense and to the interests of all producer countries."

Venezuelan officials bristled at the move to allow unrestricted imports by pipeline, truck, and tank car.

This, they felt, was "direct discrimination" against Venezuela, as well as other producing countries which must rely on tanker shipments.

**Not in on talks . . .** Because of the touchy political situation, Venezuela was forewarned of the new move by State Department officials. And, as one Venezuelan put it, "They know what our position is."

He said there will probably be "strong protestations" on the part of the Venezuelan Government.

Venezuela is especially miffed because she was excluded from much of the negotiating between the United States and Canada.

Venezuela had hoped to get some concession from Canada, principally assurance that her oil will not be barred from the big eastern Canadian market. This, it was felt, could have been worked out in three-way conversations in which Venezuela would have an equal voice.

With the State Department favoring immediate lowering of the barriers against Canadian oil, Venezuela was unable to get a guarantee that its own markets would be protected. There is some concern that Canada, with a rapidly growing oil industry, might proceed in a few years with construction of the often-discussed pipeline moving western Canadian oil to the Montreal area. This might bar Venezuela from one of its largest export markets.

**Ike is target . . .** Much of Venezuela's bitterness is directed at President Eisenhower, personally.

His original import-control proclamation had been pictured to Venezuelans as a move which might aid them in the long run by stabilizing world oil prices. Since then, there has been a round of price cuts on Venezuelan crude.

Venezuela's plight is complicated by her apparent failure to work out a firm agreement at the recent Cairo conference to prevent further collapse of international oil prices.

Giving Canada free access to U. S. crude-oil markets is expected to have little effect on the volume of imports except in the Pacific Northwest. The effect even in that area may be minor.

The flow of Canadian oil into the Pacific Northwest averaged about 90,000 bbl. a day in 1957. But about three-fourths of the Canadian oil was crowded out during the voluntary import program.

Since the imposition of mandatory controls, the flow has dropped to about 12,000 bbl. daily.

In the original mandatory program, which went into effect in March, Canada was given a special concession to supply the northern tier of refineries dependent on foreign supply.

Although foreign oil for these refineries could, theoretically, come from any place outside the United States, Canada was the logical source. In effect, this gave her an export quota of about 75,000 bbl. a day exclusive of the regular allocations.

The new concession is expected to have little effect on the over-all imports from Mexico.

**Problems at home . . .** In addition to the international repercussions caused by the import program, there was renewed opposition on the domestic scene last week.

Congressional critics, expressing alarm over the inflationary threat of import quotas, joined in a new effort to scuttle the whole program.

Petroleum price increases—actual and threatened—revived the fear of government price intervention.

The Office of Civil and Defense Mobilization, which was assigned by the President to keep price increases under "constant surveillance," soon will begin a continuing study to carry out its assignment.

The agency is expected to set up liaison with the Bureau of Labor Statistics, the Interior Department, and other bureaus which keep an eye on prices and petroleum supply and demand patterns. Through periodic reports from these agencies, OCDM hopes to detect any "dramatic changes" in petroleum prices.

If the OCDM finds petroleum prices are going up, it will have the job of determining whether the increases are "necessary" on security grounds.

"How we would go about it, I don't know," an OCDM official confessed last week.

Although he indicated that the OCDM will not object to normal seasonal price fluctuations, he made it clear that the agency is taking its police powers seriously.

**Senators worried . . .** While OCDM was preparing for its price study, two New England congressmen were urging more immediate action to hold down oil prices.

Rep. Silvio O. Conte (R-Mass.) revealed that he had written Vice President Nixon, chairman of a Cabinet Committee on Inflation, urging the group to look into the "alarming effects which may result" from the import program.

Conte expressed the fear crude-oil

prices may rise as much as 50 cents a barrel by next winter.

Sen. George D. Aiken (R-Vt.) blamed the oil-import program for a 21% price increase in asphalt. He said the average low bid received last month for 4,771,000 gal. of asphalt to be used in the Vermont highway-construction program was 16.48 cents per gallon. Average price paid for the same material last year, he said, was 13.52 cents.

## Wide-Spacing Bill

### . . . gets push by Oklahoma legislative committee.

A COMPROMISE spacing bill amending Oklahoma's mandatory 40-acre spacing law for oil wells is headed for legislative action.

The proposed change would permit wider spacing on oil wells below 3,000 ft. Wells down to 3,000 ft. would be limited to 40-acre maximum spacing.

Oklahoma's 12-year-old spacing law now makes 40 acres maximum spacing for all oil wells to 9,990 ft. The new bill would not change gas-well spacing. The compromise measure has been approved by the oil and gas committee of the Oklahoma House of Representatives.

Advocates of the revised measure believe the 3,000-ft. feature will satisfy 90% of the "problem created by forced 40-acre spacing." They feel the present law is restrictive in that it forces offset drilling, even on wells which might be marginal or on a breakeven economic basis.

Some also predict a mild drilling spree in western Oklahoma, if the bill becomes law. Others see a stepped-up drilling program in the McClain-Garvin county area where much Bromide production is in the 6,000 to 9,000-ft. range.

The 12 to 2 favorable house committee vote gives the bill a running start for house floor consideration.

Some royalty owners have expressed opposition.

**Commission to decide . . .** The amended bill would give the Oklahoma Corporation Commission freedom to determine spacing in individual cases, in all instances of oil production from 3,000-ft. depths down.

The commission now has authority to set spacing for all gas wells and all oil wells deeper than 9,990 ft.

In 1958 there was 3,110 development oil wells and 105 wildcat oil discoveries reported in Oklahoma at depths above 10,000 ft. There were 25 development wells and 11 wildcats completed at lower depths.

## watching WASHINGTON

**Joe Reilly**

### • This Business of Harassing Big Business

BIG LABOR has come to the defense of Big Business to ease the threat of government price controls.

The price notification bill introduced by Sen. Joseph C. O'Mahoney (D-Wyo.) seemed to offer a good excuse for anti-business senators to renew their attack. Because of the popular anxiety over inflation, there was some hope that the perennial bill might actually be passed this year.

O'Mahoney's senate bill 215, labeled an "anti-inflation" measure, would require advance notice of price increases by major companies in heavily concentrated" industries. It provides for public hearings to permit the Federal Trade Commission and the attorney general to investigate the "justifiability" of proposed price increases.

For the purposes of the bill, a heavily concentrated industry is one in which eight or fewer companies account for 50% or more of the production. According to 1954 figures cited by O'Mahoney, the eight leading petroleum refiners handled just over 50% of the business.

Hearings on the bill opened recently before the Senate antitrust subcommittee headed by Estes Kefauver (D-Tenn.). In presenting his bill, O'Mahoney said it was intended as "a first step to bring inflation under control."

"It is not a punitive bill," O'Mahoney assured the committee. "It does not impose any penalty for price increases." Even willful failure to give advance notice of a price increase would make a company covered by the bill subject to what O'Mahoney called a "nominal" fine of from $5,000 to $50,000.

Several witnesses spoke up in opposition to the bill. An official of the U. S. Chamber of Commerce warned that it might promote inflation rather than control it. A firm, knowing it would have to justify future price increases, would be reluctant to cut prices, he contended. Later, Roger M. Blough, chairman of the board of U. S. Steel, warned that the result of the bill would be to "immobilize prices in a strait jacket."

But probably the most effective opposition came from the United Steelworkers of America. Justification of prices, union officials feared, would also involve public scrutiny of wages. David J. McDonald, president of the union, said "the entire labor contract would be thrown into controversy" in the price investigations. Another union spokesman expressed the fear that the bill would end collective bargaining.

LABOR'S OPPOSITION MAY DEFEAT THIS BILL, but it will not end the congressional pastime of harassing big business.

The anticipated effort in the Senate to reduce the depletion allowance will be aimed primarily at large producers. Assuming there aren't enough votes for an across-the-board cut, depletion foes are expected to try again on a compromise which would reduce the rate only for the major companies.

If this fails, there is likely to be a proposal to abolish or reduce depletion on foreign production. That is probably the greatest threat to depletion in the current session. Much of its appeal comes from the fact that it would hit primarily at large companies.

There also is renewed talk of an industry split over legislation to reduce federal controls on natural-gas producers.

A group of independent producers is seeking a compromise which would free only small producers. Such a bill was sponsored in the last Congress by Sen. Russell B. Long (D-La.) and Sen. Ralph Yarborough (D-Tex.). It would have applied to producers who sold less than 2 billion cubic feet of gas per year for interstate commerce.

A similar measure may be introduced this year to replace the long-dormant Harris Bill. To reduce its discriminatory provisions, there is talk of an amendment to exempt up to 5 billion cubic feet of gas per year for each producer, whether major or independent.

*TIPRO forum shows:*

# Texans Split Over Support of Wide

WIDER well spacing is gaining ground in Texas as a means to the popular end of cutting oil production costs—but it still has a long way to go to achieve universal support there.

A panel discussion on this subject started off calmly last week in Dallas then proceeded to wax steadily hotter as an invitation for floor participation found ready acceptance.

The panel, moderated by E. Bruce Street, Graham, Tex., independent, was a feature attraction of the annual convention of the Texas Independent Producers and Royalty Owners Association.

Members of the panel were: Will Wilson, attorney general of Texas; Tom G. Kelliher, division exploration manager for Tidewater Oil Co., Houston (pinch-hitting for E. B. Miller, Jr., Tidewater vice president and chairman of Oil Industry Conservation Forum); C. L. Norsworthy, Jr., Dallas independent operator; and Walter R. Koch, Austin attorney and chairman of TIPRO legal and engineering committee.

Positions of these and other impromptu speakers from the floor ranged from solid support through conditional support, to outright unwavering opposition.

Here is what the Texans said.

**C. L. Norsworthy, Jr.**
**Dallas Independent**

I believe all producers would give serious consideration to drilling wells on larger spacing patterns provided they could readily recognize an incentive in it.

We should explore the possibility of making these recommendations which

would apply only to future fields, to the Texas Railroad Commission:

1. That the commission, on request of interested operators, set a hearing for temporary field rules before five wells are completed in a new field. The present practice is to delay any field rules until after five wells have been completed or until 18 months have elapsed, at which time the field goes off discovery allowable and field rules are written. The effect of this is that narrow spacing usually is in effect before it is known that wider spacing would drain the reservoir. It is then too late to change.

2. That we ask the commission to leave the discovery allowable in effect until after the fifth well has been completed or the 18 months have elapsed, which is in accordance with its present policy.

3. That we amend the 1947 yardstick (Texas depth guide for oil allowables) to add a fourth column providing for allowables based on 80-acre spacing (as well as those on 10, 20 and 40 acres). The commission, though it may and does grant 80-acre allowables, apparently has no fixed policy on this—and every case varies with the time of hearing.

I think a definite policy should be established so that the operator could determine what incentive he might have to drill on spacing patterns larger than the usual 40 acres.

**Walter R. Koch**
**Chairman, TIPRO Legal and Engineering Committees**

No one has yet convinced me that I will be benefited—as a landowner, a royalty owner, and a small leaseholder—by wider spacing, by eliminating exceptions to Rule 37, by a 100% acreage factor for well allowables, or by compulsory pooling.

I regard these suggestions to improve my lessee's financial position in order for him to better compete with foreign oil with the same enthusiasm as I would greet his proposal that I reduce my traditional one-eighth royalty to a one-sixteenth in order to reduce his cost of operations.

While debating the rules now governing well spacing in Texas, let us bear in mind that these spacing rules merely prescribe the minimum size of the permitted unit.

Failing to achieve compulsory pooling in Texas, big operators are campaigning now to eliminate the annoyance of the "uncooperative" small tract owner indirectly—by attempting to destroy the value of the small lease. If proposed wide-spacing rules are coupled with 100% acreage allocation (or with a very small per-well factor in the formula), no one could afford to drill a well on a small tract. The oil and gas under this tract

would be of no value to anyone except the owner of adjoining leases.

This would be a great convenience to the big company. When it went after a block of leases in a promising area, it would not have to bother to go see the small landowners.

It could take leases on the larger tracts and not worry about the gaps in its block because no one else could afford to drill a well on the small tract. If the block proved productive, it could offer to take the unleased small tracts into its units on its own terms or leave them as unleased islands and drain all oil and gas from under them without compensation.

# Spacing

**Tom G. Kelliher**
Tidewater, Houston

Most operators realize that the drainage area of a well is considerably greater than the average density upon which wells are now being

drilled. In order to encourage wider spacing, we need to reconsider the allocation formula under which most of the new fields are now produced.

I believe the Texas Railroad Commission has the power to select proration allowables which would result in an incentive to drill development wells on wider spacing. In Louisiana, the rules on spacing are quite sound and appropriate and are contributing much to the health of the industry. However, I do believe that this state should reconsider its depth allowable and include some factor which would provide an additional incentive for wider spacing.

I believe that some change in our discovery allowable, which would give additional consideration to the size of the drilling unit, would provide an incentive to start off the field development on wider spacing. If subsequent evidence is later developed which shows the need for close spacing to drain a reservoir efficiently, then the rules can be modified accordingly. But, it is impossible to undrill a well.

We have no guarantee that petroleum is going to share in increased energy demands of our nation. We face serious competition from other forms of energy. The fuel cell, nuclear energy, a reawakening coal industry—all are potential competitors.

We must practice every economy we know to insure that we stay competitive. If we cannot furnish our customers with a better and cheaper product, we are going to lose them.

**William J. Murray, Jr.**
Member of Texas Railroad Commission

You have been talking about both wider spacing and method of allocation of production. These should not be confused. It will surprise some to know that the selfish interest of the royalty owner is best served by wide spacing and the largest well percentage in the allocation formula.

To drill more wells than necessary benefits no one. Yet we are not going to permit confiscation. Someone should have the wisdom to come up with a just and equitable solution to the allocation problem.

**Robert Paine**
Dallas Attorney

Mr. Murray's statement that wider spacing and allocation are two different things is true in theory but not in practice. The people advocating wide spacing are also advocating 100% acreage allocation. These are intertwined. Such an indirect attack, if successful, could destroy the small operator and legalize confiscation.

Why can't the bigger operator go out and negotiate with royalty owners and independents? Then if it wants to drill on 160 acres, well and good.

**Will Wilson**
Texas Attorney General

The wide-spacing question may be decided through knowledge of rules of procedure. In Texas, the legislature delegates policy-making powers to the state agency regulating the industry. The duty of the courts and of the attorney general is to sustain the

commission's policy-making decisions if such can be sustained. We must sustain these decisions unless they violate the law or the constitutional rights of any person involved.

Wisdom lies somewhere in the middle of controverted viewpoints. We have found through the years that the Railroad Commission has been an excellent vehicle for finding this kind of middle-ground solution.

**Jack Woodward**
Dallas Independent

I am sure the wide-spacing folk are sincere in their beliefs. And I feel that the unnecessary well is the most shameful form of waste. But I still

think that the Rule 37 exception is the backbone of conservation in Texas and indispensable.

I am worried about this wide-spacing vehicle. I want to know if it has the proper kind of brakes. Because, if it does not, don't put it on that hill!

**Hamilton Rogers**
Texas Pacific Coal & Oil Co., Fort Worth

An unfair advantage accrues to the small-tract owner when he is allowed to produce more oil than underlies his tract. But at the same time, the small fellow would surely be trampled if we do not preserve private ownership of property.

I like the modification of statewide rules suggested by Norsworthy with exceptions given to county regular fields and piercement-type salt domes—but still protecting the small-tract owner.

**Jack Porter**
Houston Independent

I suggest an alternative or complementary change in Texas regulatory policy which I feel would work well

—that is for the Railroad Commission to assign, where it could, lease allowables instead of well allowables.

Texas and Louisiana are the only states still basing allocation on a per-well basis.

Where an operator has a lease where a spacing pattern would require 10 wells for full development and a maximum allowable, give him that allowable but let him produce it with only one or two or three wells.

**Johnny Mitchell**
Houston Independent

Small-tract drilling is justified by its proponents on grounds that it protects the small lease owner and his royalty owner from confiscation. But

in permitting such drilling, the state allows this operator and royalty owner to confiscate many times more oil and gas from adjoining lease owners and royalty owners.

Many Rule 37 exceptions, like those for irregular shaped acreage, are justified. But many others are not. Nearly every gas field in Texas has a "1-acre" well.

As long as the law of capture is applied in such a manner there will be waste and high costs and confiscation. Regulations can be devised to restrict "raiding" when the industry as a whole wants them.

**Brian W. Payne**
Tyler Independent

The current intensive drive for wide spacing is a smoke screen under which major companies hope to do away with Rule 37. They charge that independents are operating wastefully. We are not wasteful! There isn't an individual in here that can't operate 50% under any major you can name. Let them operate like we do if they really want to cut costs.

# Phillips Ruling Not Policy

## . . . of FPC yet, Kline tells TIPRO. Cost-of-service basis can't be made to work in regulating small gas producers.

THERE IS no guarantee that the Federal Power Commission will accept the recent Phillips Petroleum Co. ruling of its examiner, Joseph Zwerdling.

And even if it should, there is no assurance that FPC will apply the same cost-of-service formula to smaller producers.

In fact, Judge Arthur Kline of the FPC feels that since the FPC is required to regulate gas prices paid to producers, the best way to do it is on an area basis.

Kline last week told the Texas Independent Producers and Royalty Owners Association in Dallas that FPC can set prices for a certain field most fairly and efficiently by basing its decision on prices and producing conditions in the general area in which the field is located.

Kline said it is his personal opinion that cost-of-service regulation of producers simply won't work. It might work with a large firm, but not with a small operator.

If a test year were used to fix a small producer's costs and determine his rates for future years, the result often would be "either to justify a far higher price than he could obtain for his gas or allow him such a ridiculously low price as to discourage further drilling."

Even the area approach to rate-fixing, Kline said, would only be making the best of a bad deal. This is his own personal opinion, he said, and is not necessarily that of the whole commission.

**Legislation vital . . .** The need for legislation either exempting producers or establishing some clear-cut means of regulating them keeps getting more desperate, Kline said.

He does not think the answer to the present enigma, however, lies in exempting the small gas producer from regulation.

Such would reduce the FPC's work load by cutting the number of cases. But it would be impractical.

Such a bill, introduced by Senators Long and Russell, would exempt operators who produced less than 2 billion cubic feet the preceding year "alone or in the aggregate with affiliated producers and gatherers."

This bill is so written that many small firms still would be subject to regulation. Still under control apparently, he said, would be any producer in a unitized field, one whose gas is gathered jointly with other operators, or one who sells jointly with others to a processing plant.

Amendment to exempt all small operators, he said, would prevent many difficulties. In a unitized field, he said, "we would have part of the gas subject to regulation" and part free.

"If the unregulated gas in such a field received a higher price than the regulated gas, there would inevitably be triggering of favored-nations clauses and price redeterminations resulting in higher prices for the regulated gas.

"Exemptions of intrastate sales of gas and wholesale sales by pipelines has caused many problems for the FPC. Exemption of still more gas from regulation would create even more."

**Hope for Harris bill? . . .** Kline said he feels that legislation along the lines of the Harris bill can be passed and that such would be about the best the producer can get.

To get even this, however, will require two things:

**. . . Industry unity** in supporting a bill.

**. . . Educating the public.**

The only argument that is likely to have any effect on the gas consumer is that concerning the price he is going to have to pay for gas. The average person "has been led to believe that the principal element in the cost of gas to him is the price paid to the producer.

"The producer must bring home to the consumer the fact that only a very small fraction of the price paid by him for gas goes to the producer."

**Exemption bill pushed . . .** Despite Kline's disapproval of a bill exempting small producers from FPC regulation, TIPRO decided to push some form of bill to do this.

The reasoning is that it, along with freeing up to 98% of gas producers from regulation, would also benefit the major producers by:

**. . . Lightening FPC work load.**

**. . . Forcing FPC** to consider the price smaller, nonregulated producers were getting in setting prices for the big companies.

**Harry Jones**
. . . new TIPRO president.

## East Texan Named

### . . . TIPRO president. Other leaders cited for service.

HARRY C. JONES, East Texas operator, last week was elected president of the Texas Independent Producers and Royalty Owners Association at the group's thirteenth annual meeting in Dallas.

Jones, a producer and a partner in Carter-Jones Drilling Co., Kilgore, Tex., succeeds Eugene M. Locke, Dallas.

The new president, a veteran wildcatter since the early days of East Texas field, has been highly active in TIPRO. He has served on many association policy committees and on the executive committee since 1954.

He was 1957-58 membership chairman and, during the past year, headed the important inter-association state-action committee.

J. F. West, Stamford, Tex., was named secretary. Other 1959 officers, all reelected, include: W. Earl Turner, Austin, executive vice president; Vance Foster, vice president of the First National Bank of Dallas, treasurer; and John Davenport, Austin, general counsel.

**Ikard honored . . .** TIPRO's annual "Hats Off" award went to Rep. Frank Ikard (Dem.), Wichita Falls, Tex., "for playing a leading role in the establishment of mandatory imports curbs through Presidential action."

The association also credits him with effectively resisting attacks on percentage depletion and working to free independent gas producers from federal utility regulation.

Other awards went to:

**. . . Gordon Johnson,** San Antonio independent, for outstanding service as association membership chairman.

**. . . Locke, retiring** president, for hardhitting, effective 1958 leadership.

**. . . J. L. Latimer,** president of Magnolia Petroleum Co. Latimer received Lone Star Steel Co.'s "Roughneck Award," presented annually to an oil veteran who has achieved a place of honor in the industry.

## Rock Island Buys

### . . . interests in refinery, crude-purchasing and two pipeline companies.

A 39% INTEREST in the Great Northern Oil Co. refinery at Pine Bend, Minn., and interests in a crude-oil purchasing and two pipeline companies have been acquired by Rock Island Oil & Refining Co., Inc., of Wichita.

Rock Island has purchased the refinery interest, a 20% interest in the South Saskatchewan Pipe Line Co., and 40% interests in the Minnesota Pipe Line Co. and the Great Northern Oil Purchasing Co. from Sinclair Refining Co., Sinclair Pipe Line Co., and Sinclair Oil Purchasing Co. Purchase price was not disclosed.

The 33,000-bbl. Pine Bend refinery, on stream 3½ years, processes Saskatchewan crude. No change in management is contemplated.

Crude is delivered through the 214-mile, 12 to 16-in. line of the South Saskatchewan pipeline from Fosterton field east to connect with Interprovincial and through the 256-mile, 16-in. Minnesota line from Clearbrook, Minn., to Pine Bend.

The purchasing company buys 45,000 bbl. of crude daily and delivers that part not sent to the Pine Bend refinery to Canadian sources. Most of the products from the refinery are committed to Mobil Oil Co.

F. C. Koch of Wichita is board chairman and president of Rock Island. Other owners of the four facilities are Woodley Petroleum Co. and J. Howard Marshall interests.

## 5 Rumberger Abandoned

SHELL Oil Co. has temporarily abandoned the world's second deepest wildcat in western Oklahoma, but the hole will be left open for further observation.

The 5 Rumberger in Elk City field, Beckham County, was drilled to 24,002 ft. last fall to test the deep Springer (OGJ, Dec. 8, 1958, p. 77). The hole was plugged back to 13,887 ft., and minor gas shows were tested in the Atoka.

Greatest volume tested was about 1,500 M.c.f. daily for a short period. Gas volume diminished after treatment. The four sets of perforations still open are between 13,554 and 13,885 ft. Regular production at Elk City is from Hoxbar conglomerate at about 10,500 ft.

The Rumberger operation cost about $2,000,000. Bottom-hole temperature at such a great depth was 362° F. This well and Phillips Petroleum Co.'s 1-EE University in Pecos County, Texas, the world's deepest well, were drilled about the same time. The 1-EE was plugged last winter at total depth of 25,340 ft.

## FPC Denies El Paso Request

THE Federal Power Commission has refused to determine whether the Southern California market for natural gas is large enough to warrant two new pipelines to the area.

El Paso Natural Gas Co. sought the ruling, which might have delayed plans of the rival Transwestern Pipeline Co. to build a line from West Texas and New Mexico to the Arizona-California border.

The Commission also denied an alternative request by El Paso seeking a comparative hearing on the two proposed pipelines. El Paso, together with Pacific Northwest Pipeline Corp. and Colorado Interstate Gas Co., is seeking FPC authority to build a new line between Rock Springs, Wyo., and the California border.

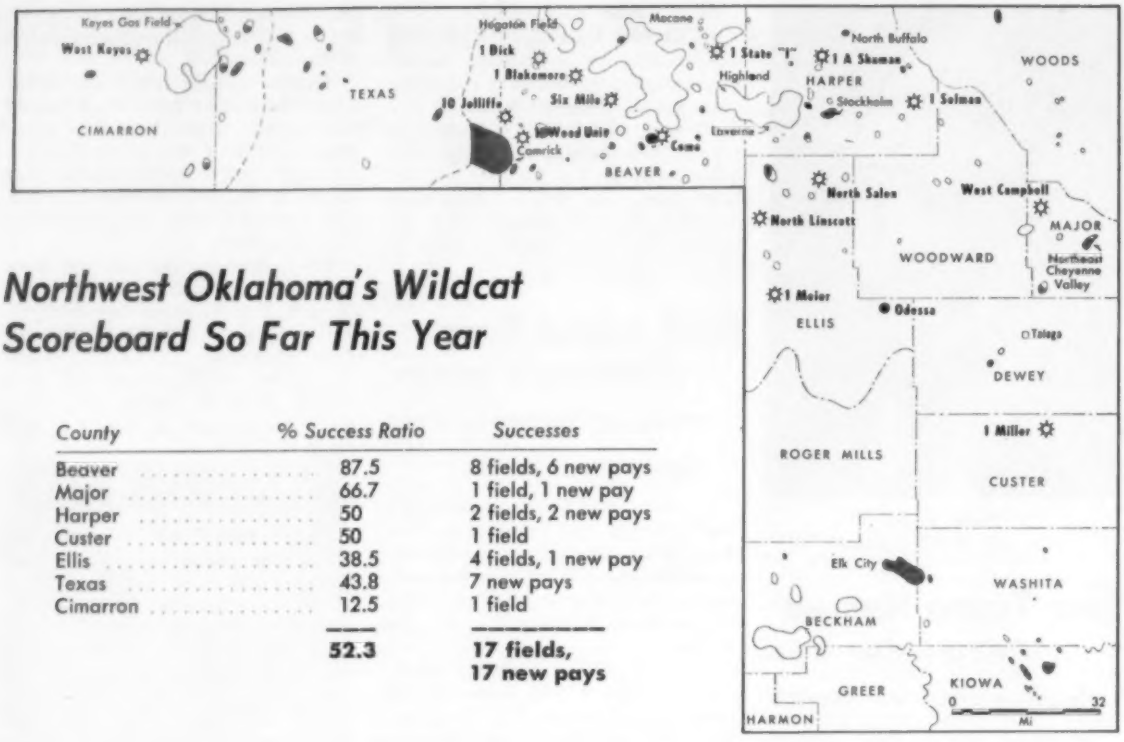
In denying the motion, the FPC noted that El Paso waited until 2 days before the close of the Transwestern hearing to file it.

## Tidewater Fleet Grows

TIDEWATER Oil Co. probably will have the most efficient tanker fleet afloat with the addition in the next 2 years of seven new supertankers. It will boost Tidewater's fleet to 21 ships—each a high-speed vessel in the supertanker category.

Tidewater last week disclosed arrangements for a $92-million loan from an insurance firm to finance construction of the seven new tankers.

Construction of the tankers—each in the 68,000 to 72,000-ton class with an average capacity of 500,000 bbl.—is the latest step in a program started 4 years ago. Only 2 years ago, Tidewater's fleet totaled 320,000 tons. The seven new ships, to be built in Japan or France, will add about 500,000 tons. They will be about 840 ft. long and have a speed of more than 16 knots.




## *Northwest Oklahoma's Wildcat Scoreboard So Far This Year*

| *County* | *% Success Ratio* | *Successes* |
|---|---|---|
| Beaver | 87.5 | 8 fields, 6 new pays |
| Major | 66.7 | 1 field, 1 new pay |
| Harper | 50 | 2 fields, 2 new pays |
| Custer | 50 | 1 field |
| Ellis | 38.5 | 4 fields, 1 new pay |
| Texas | 43.8 | 7 new pays |
| Cimarron | 12.5 | 1 field |
| | **52.3** | **17 fields, 17 new pays** |

# Oklahoma Area Has Top Success Story

**• Operators have hit 34 times out of 65 tries, giving seven counties in northwestern part of the state a whopping 52.3% wildcat success ratio. Beaver County has 14 successes out of 16 wildcats.**

A BATTING average that wildcatters dream about has come true in Oklahoma's portion of the northwestern Anadarko basin—making it the brightest spot on the exploratory scene so far this year.

The wildcat success ratio for seven northwestern counties is 52.3%—the highest in the nation. The score reads 34 successes out of 65 wildcats drilled since the first of the year, for a 1-out-of-2 clip.

This impressive succeess story is being written in Beaver, Cimarron, Texas, Harper, Ellis, Major, and Custer counties.

The over-all ratio, however, is almost overshadowed by the tremendous success in Beaver County, where operators have scored on 14 out of 16 wildcats. This 87.5% ratio breaks all previous records for wildcatting in any one Oklahoma county.

**Source . . .** The figures are based on recorded wildcat completion data gathered by the Journal.

The success totals include new fields, new pays, or long extensions to some of the older fields.

Here's a county-by-county rundown on activity:

**. . . Beaver.** Just like it's name, Beaver County consistently has been one of northwestern Oklahoma's busiest and most successful counties in exploratory and development drilling. A decade ago, the Beaver County map was blank. Today, it's dotted with oil and gas reservoirs.

The two latest finds in Beaver County were gas-condensate discoveries.

One, Sunray Mid-Continent Oil Co. and Big Chief Drilling Co. 1 Wood Unit, produced from two zones. Located in C NW SE 12-1n-20eCM, it flowed 105 bbl. of condensate and 67,500 M.c.f. of gas daily from Morrow at 7,737-72 ft. and 45 bbl. of condensate and 19,500 M.c.f. of gas from the Chester at 7,828-68 ft.

The other discovery, Panhandle Eastern Pipeline Co.'s 1 Dick, flowed 7.5 bbl. of condensate and 2,142 M.c.f. of gas daily from the Chester at 6,512-45 ft. It is located in C NW NW 31-5n-21eCM.

Two recent Beaver finds—both Morrow Pennsylvanian discoveries—opened first production in two townships. They are Republic Natural Gas Co. and Moran Bros. Drilling Co. 10 Jolliffe estate in 3n-20eCM and Katex Oil Co.'s 1 Blakemore in 4n-23eCM. The 10 Jolliffe flowed 236 M.c.f. of gas daily from 6,728-38 ft. The 1 Blakemore flowed 2,200 M.c.f. of gas daily from 6,320-26 ft.

Another field-opener in Beaver is Harper Oil Co.'s 1 Miller in 3n-23eCM. This Morrow gasser opened Six Mile field with 7,684 M.c.f. daily.

There were two separate discoveries in the Como area. Pan American Petroleum Corp. 1 Lewis G. Pierson in 30-2n-25eCM flowed 744 bbl. of oil per day from the Morrow, and Rip C. Underwood et al. 1 Baggerly Unit flowed 66 bbl. of condensate per day and 6,600 M.c.f. of gas daily from Morrow.

Petroleum, Inc., 1 State "I" opened a new Morrow gas field in 16-5n-

27eCM. The well flowed 58,000 M.c.f. daily.

Other discoveries in Beaver County this year were six scattered Pennsylvanian new-pay strikes in the Highland, Camrick, and Mocane areas.

... **Major.** With the second highest success ratio, Major County has a new gas field and a new-pay discovery. The new field is one of the most important in the region. Sinclair Oil & Gas found Hunton gas production at the 1 Spafford, opening West Campbell field as the first Hunton producer in the Anadarko basin.

A new Pennsylvanian sand was added to prolific Northeast Cheyenne Valley field. This field, opened last year, has Pennsylvanian wells of more than 1,000 bbl. on initial potentials.

... **Custer.** Custer County's score is one out of two wildcats. Despite the low number of wildcats drilled, the year's most important discovery has just been completed at Magnolia Petroleum Co.'s 1 Miller. This Hunton gas discovery flowed 95,000 M.c.f. daily from perforations at 14,800 ft. It opened the second Hunton producer in the basin, first production in the county, and the deepest Hunton production anywhere.

... **Harper.** Calvert Drilling Co. discoveries opened Harper County's two new fields. The 1-A Shuman flowed 3,200 M.c.f. of gas daily from Morrow sand. The 1 Selman flowed oil and gas, 23 bbl. of oil from the Morrow and 13 bbl. from a Tonkawa Pennsylvanian zone and 1,248 M.c.f. of gas daily from Morrow and 7,536 M.c.f. daily from Tonkawa.

There were two new-pay strikes in the Stockholm and North Buffalo areas. Sinclair recently completed a triple-pay producer in Pennsylvanian zones at North Buffalo for 424 bbl. of oil daily (OGJ, Apr. 20, p. 177). This field, with both Pennsylvanian and Cambro-Ordovician oil, was considered the exploratory highlight of 1958 in northwestern Oklahoma.

... **Ellis.** This fairly new member of the state's producing counties has three new gas fields and one new pay.

Three of the new fields produce from the Morrow. Magnolia's 1 Meier flowed 12,800 M.c.f. of gas daily from 10,668-11,245 ft. Pan Am's North Linscott discovery flowed 23,750 M.c.f. of gas daily from 9,088-94 ft. Pan Am also opened the other field, North Salon, with its discovery which flowed 1,744 M.c.f. of gas daily from 7,988-8,014 ft.

The fourth new field in Ellis County is Odessa Natural Gasoline Co.'s Cottage Grove Pennsylvanian discovery that flowed about 400 bbl. of oil per day.

**Western Panhandle** . . . Texas and Cimarron counties didn't fare too well on successes, but important development work inside Hugoton gas field highlighted drilling.

Texas County's seven discoveries were all new pays or extensions in the Carthage, Postle, and Hough areas in the northwestern corner of the county. These fields have good Pennsylvanian oil production beneath the Hugoton Permian gas field.

Cimarron County has one new gas field, a basal Pennsylvanian gas strike west of Keyes field. It is J. S. Abercrombie's 1 L. E. Twining. It flowed 6,220 M.c.f. daily from both Atoka and Morrow, opening West Keyes field.

## Zapata to Sell Rigs

### . . . and Off-Shore interest in major policy change.

ZAPATA Petroleum Corp., Midland, Tex., has made arrangement to sell its 40% stock interest in Zapata Off-Shore Co.

Also, Zapata Petroleum will sell five land drilling rigs owned by itself and its subsidiary, Zapata Drilling Co.

Pres. J. Hugh Liedtke of Zapata Petroleum said the company's board of directors decided to concentrate on oil and gas exploration and the purchase of producing properties.

Zapata Off-Shore Pres. George W. Bush will resign as vice president of Zapata Petroleum but will remain on the board of directors.

Bush recently moved the headquarters of Zapata Off-Shore from Midland to Houston. The company owns the Scorpion and Vinegarroon drilling barges and the converted Nola 1 floating drilling ship.

Under an agreement reached by the two Zapata companies, which will operate separately hereafter, Zapata Petroleum is selling 100,000 shares of Zapata Off-Shore stock at $8 per share.

## *the* JOURNAL *said* . . . .

### 50 *years ago*

May 6, 1909

Drilling for oil and gas in the Malheur-Vale district of eastern Oregon is being pushed with seven rigs running. One well already has struck gas sand at 2,200 ft. Drilling so far has been with standard tools, but the first rotary is being installed.

Oil unlike any so far found in Oklahoma was tested last week in a well being drilled by Hammer & Co. in the Madill area of Marshall County, on the Red River. It is straw-colored, almost transparent. Gravity, above 48°, is so light there are no instruments in Oklahoma able to take it, so oil samples have been sent to Gulf Refining Co.'s refinery at Port Arthur, for analysis.

Surveys begin for the crude-oil pipeline Standard Oil Co. (La.) proposes to lay from Oklahoma to Baton Rouge, La., where it will build a $2,000,000 refinery.

Cable to London reports striking oil in the No. 1 well of Egyptian Oil Trust at Jensah, 150 miles south of Suez on the Egyptian side of the Red Sea.

### 25 *years ago*

May 3, 1934

The longest string of tubing ever pulled with portable well-pulling equipment was recovered without incident last week from Group No. 1 Oil Corp.'s 1-B University Lease in the Big Lake field, in Reagan County, West Texas. The string consisted of 8,394 ft. of 2½-in. upset tubing.

Superior Oil Co.'s initial Gulf Coast drilling venture, located on the Bosco project in Acadia Parish, Louisiana, is being completed as a good oil producer. The well, 1 Hermandes, drilled to 8,916 ft., flowed 60 bbl. per hour from a 7,800-ft. sand. Superior is drilling six other wildcats, all started before a barrel of oil was found.

HEADLINES—World's fair of petroleum industry to open in Tulsa May 12 . . . Sinclair Prairie Oil Co. to become big factor in Rocky Mountains . . . New deep drilling play makes Leesville one of the most active fields on Louisiana Gulf Coast.

### 10 *years ago*

May 5, 1949

First oil strike on Kansas side of Forest City basin watched as forerunner of new exploratory play in state's northeastern counties. Viola lime, at 3,200 ft., proves productive in Carter Oil Co. wildcat in Wabaunsee County.

New Standard Oil Co. of California-Salt Lake Refining Co. Salt Lake City refinery, on stream less than 6 months, will undergo $10,000,000 expansion.

FPC authorizes Trunkline Gas Supply Co. to proceed with laying $85,000,000 natural-gas pipeline linking Texas-Louisiana Gulf Coast gas reserves with midwestern markets. Proposed 1,500-mile, 22-in.-26-in. line to connect at Palmyra, Neb., with Northern Natural Gas Co.

HEADLINES: Mexico welcomes private enterprise but demands compliance with laws . . . Drilling in Saudi Arabia-Kuwait Neutral Zone to start soon . . . Sinclair Petroleum Co. spuds first Ethiopian oil test.

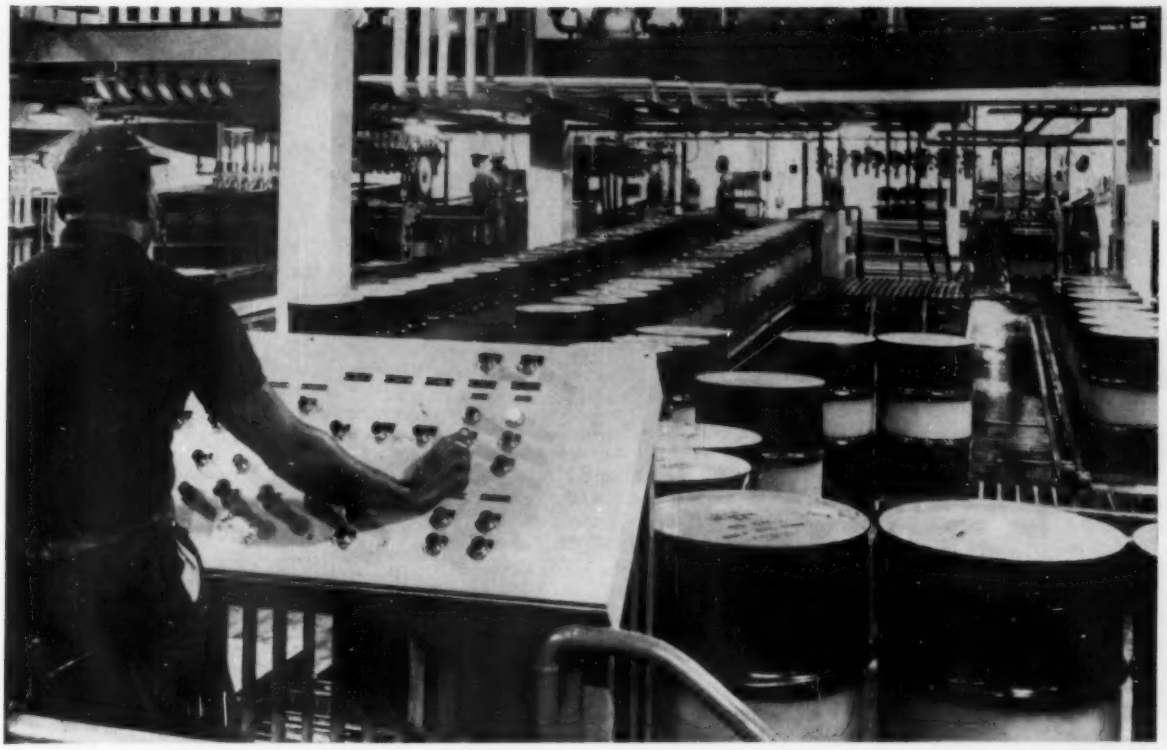
## PHOTOS IN THE NEWS

### Golden Derrickman at IPE

Near-disaster marked the raising of the 7,500-lb. "Golden Derrickman" onto the 136-ft. drilling mast at Mid-Continent Supply Co.'s display at the International Petroleum Exposition grounds in Tulsa. While workmen jockeyed the 50-ft. figure into position, a gust of wind created some tense moments—but resulted only in some damage to one of the Derrickman's arms. The figure, sheathed in glittering gold paint, contains 5,000 lb. of reinforcing steel and pipe and has a mesh wire outline of the body contours. More than 1,000 man-hours went into the production, created by Dallas Meade Pageantry Co. The 10-day exposition opens May 14.

### Jet-Fueling System Ready

The world's largest airline underground fueling system has been completed at Miami International Airport. It was built for Eastern Air Lines by Orange State Oil Co., affiliate of Cities Service, at a cost of $1,250,000. It will pump 11,000 gal. of aviation fuel a minute to Eastern's 22 airplane loading positions. An 18-in. line carries jet fuel and two 14-in. lines carry aviation gasoline from a storage area a mile from the terminal building.



## Giant Grease Plant

Gulf Oil Corp. has completed its multimillion-dollar package and grease plant—the biggest in the world—at Port Arthur, Tex. The automatic operation turns out 800 tons daily of petroleum-based products. The control panel above moves oil drums from filling machines (in background) to palletizers, from which they are transported to an adjacent warehouse.

## Fish and Oil Mix

California is jealous of its clean beaches and good fishing. And when the oil companies started to drill in the coastal waters the public was concerned. As this photo shows, there was no need for alarm. It was made on the ocean floor where the drill bit enters the earth under Standard of California's Summerland platform. The company's unique plan for washing cuttings before dumping them on the ocean floor has eased the fears. A fish census before drilling started and others since then show that fish population is increasing. California has found, too, that fish are increasing in numbers around Richfield's island off Rincon, where kelp beds have formed around the 31-ton tetrapods which protect the island fill. Here, too, the fish are growing in numbers. It's a good thing they did. Oil operations offshore might otherwise have suffered a major setback.

# New Sand-Control Methods Working

**• Down-hole control techniques confine sand to bottom of well. Case histories of four different approaches to the problem presented to West Coast API meeting.**

SHOULD the sand be produced with the oil, or is it better to confine the sand at the bottom of the well?

This question has been facing California operators for the past half-century in fields where the oil sands are dirty and unconsolidated or interfingered with shale beds.

It's still unanswered. But because many production men believe the latter method is the better route, better methods of sand control are continually being sought.

At last week's API Division of Production meeting in Los Angeles, case histories on four of the newer down-hole control methods were given. They varied widely in technique, consisting of:

... **Double-wall liners** with relatively large slots.

... **Walnut shells,** graded for size and plastic coated.

... **Close-fitting liners** of conventional design, run in wells completed with oil-base fluid.

... **Wire-wrapped liners,** in which a wire wrap is placed on slotted or perforated liner.

**Double-wall liner . . .** Douglas Oil Co's. experience with the double-wall (or "Fether") liner was given by T. A. Atkinson.

The new type liner is installed in three Douglas wells in the West Cat Canyon area where sand cuts in some wells run as high as 85%. Conventional liners have proved to be unsatisfactory because of collapse brought on by sloughing.

One well described by Atkinson was completed with a conventional liner in early 1956. Because sand cuts ranged from 8% to as high as 84%, the pump had to be pulled 14 times in the first 5 months of production. When the well was pulled the last time the liner was found to have collapsed.

The Fether liner, which takes advantage of a truss-type fabrication in the other wall, was run in the redrilled hole in March 1957. Four pulling jobs were required in the next 14 months, due to sand bridging near the top of the liner, but the sand cut was only in the range of 2 to 8%.

Both the second and third wells equipped with the double-wall liner were completed with very low sand cuts. The last well has been on continuous production since February 1958, producing more than 17,500 bbl. without need for a pulling job.

**Walnut shell . . .** Plastic-coated walnut shells proved quite effective for sand control at six wells in the Long Beach and Wilmington fields, J. M. Billings of Richfield Oil Corp. said.

In every case the wells have been sand free since they were recompleted last year and in early 1957.

All of these wells were in producing intervals which were bad sand producers. The treatment not only solved this problem but also increased their net oil production in most cases. The increases, Billings said, were probably due to the cleaning action of the sand load pumped in ahead of the plastic and walnut shells.

In treating producing intervals of about 40 ft., a sand "spear" of 4,000 lb. was used. This was followed by two stages of 20-40 mesh walnut shells and plastic, totaling some 1,400 lb. per stage. The plastic was a phenolic resin, the same as that used in squeezing and cementing operations.

**Close-fitting liners . . .** This method has helped operators in the Fruitvale field, but experience has shown that production practices also have a profound influence on sand control. This was brought out by Bruce Grover of Western Gulf Oil Co.

The problem there stems from clays and silt in the producing zone. Water, either from water-base drilling fluids or upper zones, causes the clays to break down and free the sand so it can move toward the well bore. Pressure surges aggravate the situation, Western Gulf engineers have found.

Effective sand control was secured in 61 wells by adoption of the following completion program:

... **Use oil-base fluids** to drill through all potentially productive oil zones.

... **Drill the smallest** hole (7¾-in. for 7-in. and 6⅛-in. for 5½-in. flush-joint liners) that will accommodate the casing or liner.

... **Cement** the pre-perforated casing or line into the hole through perforations at the top of the zone.

... **Control** the rate of production after completion to avoid pressure surges in the well.

... **Restrict** the use of mechanical well-stimulation tools such as down-swabbing and circulation washing.

**Wire-wrapped liners . . .** This method apparently is satisfactorily controlling sand movement at the nine Wilmington field wells in which they have been used, Claude Wright, Long Beach Oil Development Co., declared.

Unless some method of control is used, this field's soft, dirty sands will slough off when a well is placed on production. Increased water production causes the situation to become even worse, due to its destroying the bonds of the interstitial clays.

Except in one case the wells with wire-wrapped liners have lower decline rates than comparable wells equipped with either float-packed, prepacked, or conventional liners, Wright pointed out. He attributed this less plugging tendency to the larger inlet area of the wire-wrapped liners.

## PIPELINE

**Five contracts** covering 1959 construction for Saskatchewan Power's gas-system expansion have been awarded. The projects, contract price, and contractors are: 113 miles of 8-in. from Regina to Yorkton and 72 miles of 4 and 6-in. from St. Louis to Tisdale, $659,000, Marine Pipeline and Dredging, Vancouver; and 80 miles of 10-in. from Success to Rosetown, $328,650, Dutton - Williams Brothers, Edmonton. Cost of the projects, including materials, amounts to $5,950,000.

**Construction** will get under way this week on a 45-mile 6 and 8-in. crude line from Laverne, Okla., to the Harper Ranch station of Jayhawk Pipe Line in Clark County, Kansas. Cameron Crude Oil, Tulsa, has awarded the contract to Monarch Constructors, Medicine Lodge, Kans.

A 16-mile gathering system in Harper County, Oklahoma, also will be built. The trunk line will be operated by Wheat Belt Pipe Line, a

## Zippered Belt Hauls Carbon Black for Rubber Plant

FACILITIES for the production of synthetic rubber containing tiny particles of carbon black have been placed on stream at the Port Neches, Tex., plant of Goodrich-Gulf Chemicals, Inc.

The new equipment, which cost more than $1¼ million, will produce 15 million pounds of black masterbatch per month.

A feature of the installation is equipment for handling the powdery carbon black. Delivered in railroad cars, the carbon black is discharged into a zipper belt conveyor (left photo). The belt is automatically closed into a tube by rubber zippers. Traveling in a trench (right photo), the belt moves to storage silos where the zippers open and the carbon black is discharged.

# BRIEFS . . .

new Cameron subsidiary. Two southwestern Kansas pools, Eubank and Taloga, are being connected to Jayhawk.

**Expansion of nine** compressor stations is under way on the Michigan Wisconsin system. Ford, Bacon & Davis Construction has the contract to install additional compressor engines totaling 17,880 hp. The station expansion, as well as 373 miles of 24-in. loops, is scheduled for completion July 1 to permit delivery of 80,000 M.c.f. of gas daily from Laverne field in northwestern Oklahoma.

**A 9-mile 6-in. spur** to the Yuma, Ariz., Marine auxiliary air station is being constructed by Southern Pacific Pipe Lines. The products line, and a 60-hp. pump, will be installed by August 1.

**Pipe laying is expected** to be finished this week on the 35-mile 10-in. products line being built by Everglades Pipe Line from Port Everglades to the Miami International Airport. Latex Construction of Georgia has the contract for the project.

**New lease connections** and gathering extensions in southeastern Utah have been completed by Four Corners Pipe Line. The company laid 16 miles of 4-in. and 2 miles of 6-in. A 1-mile 16-in. line will be installed this month from the Los Angeles terminal to the General Petroleum refinery.

**API's Division** of Transportation will unveil a plaque at Titusville, Pa., May 15 honoring Samuel Van Syckel, pioneer who built the first successful oil pipeline system. Van Syckel's wrought-iron line, built in 1865, was 5 miles long, 2 in. in diameter. Three steam-driven pumps pushed a capacity load of 80 bbl. an hour.

**Gathering lines** totaling 90 miles of 2 through 10-in. will be laid this year by Panhandle Eastern Pipe Line. Hall Construction has the contract for the gas-gathering systems.

**Lateral lines** totaling 171.5 miles of 2, 3, and 4-in. diameter will be laid this year by Canadian Western Natural Gas, Calgary. Company crews will complete the construction by October 1.

### Also for Pipeliners . . .

**IN THE NEWS:** Kline says he's convinced cost of service formula for setting gas prices won't work for small producers (p. 66) . . . Rock Island buys two pipelines from Sinclair (p. 67).

A complete list of pipeline projects is carried in the last issue of the month. Current projects are carried in Pipeline Briefs.

**PLUS THESE TECHNICAL REPORTS:** Making compressor stations quiet enough to live with (p. 96) . . . Microwave replaces wireline system for Peru pipeline (p. 114) . . . Mechanical watch dog looks for gasoline vapors (p. 124).

# Tanker Deal Attacked

## . . . as $8-million windfall. Senator Williams hits Onassis contract involving construction of three new oil tankers.

IS THE GREEK shipping tycoon, Aristotle S. Onassis, getting an "$8,-million windfall" for construction of three tankers under a U. S. Government contract?

Or is the Government getting a bargain by adding three new tankers to its fleet in exchange for 14 old ships that were lying idle and growing obsolete?

These questions were being heatedly debated in Washington last week following a senator's denunciation of a recent agreement between Onassis and the Maritime Administration.

Sen. John J. Williams (R-Del.) sees the agreement as a "windfall" to a foreign shipowner. He told the Senate that government money was being used to guarantee a mortgage representing 87½% of the cost of three ships "which are being built by a wholly owned foreign company."

According to a spokesman for the Maritime Administration, the whole deal has been a "goldfish-bowl" operation, with the entire record available for public scrutiny. Financing, he said, was arranged through a bank under a so-called Title 11 guarantee which is available to any American shipbuilder.

Under the Maritime Administration agreement, the three tankers are to be built at Bethlehem Steel Co.'s Quincy, Mass., yard by Victory Carriers, Inc. Two of the tankers are to be 46,000 deadweight tons, costing $12,650,000 each, and the other is to be 106,800 tons, costing $26 million.

The Delaware senator said Victory Carriers is owned by United States Petroleum Carriers, Inc. He said three-fourths of the parent company's stock is held in a trust fund established for Onassis' two children.

"In anticipation of the need to establish an American identity to some of his companies and thereby qualify for U. S. government aid," Williams said, "Mr. Onassis arranged that his two children be born in this country."

Victory Carriers is a Delaware corporation. Its officers and directors, though listed as American citizens, were described by Williams as "mere figureheads."

"It is perfectly ridiculous to find that our Government is putting up seven-eighths of the construction costs of the ships foreign owned and controlled," said Williams, "and it is even more ridiculous to find it giving him another $8-million windfall to sign the contract."

**Aristotle S. Onassis**
. . . a bargain for the Government?

Williams said this was not the first time that questions had been raised in Congress as to the "special treatment" extended to Onassis by the Maritime Administration and other departments of Government.

**Background outlined . . .** Under a 1957 agreement, which Williams said involved a $20-million "windfall" to an Onassis company, the Maritime Administration permitted the Greek shipping magnate to transfer 14 ships from American to foreign registry.

Under the earlier contract, Williams said, Onassis was to build three tankers to be operated under American ownership. In event he failed to build the ships as agreed, without the benefit of government guarantees or subsidies, Onassis was to forfeit $8 million to the U. S. Government, Williams said.

When Onassis failed to build the three tankers the Government filed suit to collect the $8 million. The Government also sought forfeiture of the 14 ships and recovery of profits for 18 months while they were under foreign registry.

Before the cases were decided, Williams said, Onassis and the Maritime Administration resumed negotiations. Terms of the new agreement provided for dropping of the Government's court action against Onassis.

Twelve of the 14 ships which were transferred to a foreign flag were tankers, and the other two were liberty cargo ships.

The maritime Administration takes the view that it's good business to trade idle ships for modern tankers which are badly needed for security. It's pictured as a reversal of the normal foreign-aid pattern to spend foreign money at an American shipyard for construction of tankers flying the American flag and hiring American crews.

Onassis had balked earlier at the construction of the three tankers on grounds they would not be economical because of oil-import restrictions. However, as far as the Maritime Administration is concerned, he had not defaulted in his construction contract.

A spokesman for Sen. Leverett Saltonstall (R-Mass.) also defended the Maritime Administration's action. The recent agreement, he said, was "made in accordance with existing law."

# Creole Cuts Staff

## . . . in New York to reduce costs. Some are retired.

A DRASTIC cutback in the New York staff of Creole Petroleum Corp. is in progress.

The big Venezuelan crude producer is reorganizing its New York office and consolidating its operations as part of a cost-slashing program. The company is retiring some personnel and making an effort to place others elsewhere, preferably with other affiliates of Standard Oil Co. (N. J.).

The company denied the move was prompted by the recent increase in Venezuelan income taxes. It said the reason is a determination to become as competitive as possible.

Since Creole's New York setup is small, less than 100 persons will be affected. These will be retired, transferred, or placed elsewhere in a program that will continue for another month or two.

Creole has also reduced the total number of employes on its payroll. The newly issued annual report lists an average of 15,200 employes last year, 1,100 less than in 1957.

Crude output of 1,080,717 bbl. daily was down 6%. Refinery runs of 307,-904 bbl. daily were down 4%. The company's net income under the new income tax law was $231.9 million. A $320-million net had been anticipated.

# Olefin Curb Pushed

## . . . for Los Angeles County by air-pollution officials. Refiners figure it would cost them about $60 million.

WEST COAST refiners are girding for a fight against an anti-smog proposal which would mean about a $60-million tab for new plant equipment.

The battle line was drawn by the recommendation of the Los Angeles Air Pollution Control Board to restrict olefin content of gasolines sold in the Los Angeles Basin to a maximum of 12.5%.

The APCD says a typical Los Angeles Basin mix now contains about 23% olefins, while industry sources place the average olefin content of premium gasolines marketed by majors on the West Coast at 16.6% and regular at 13.7%.

Equipment to meet the 12.5% limit would cost the industry about $60 million, according to one refinery expert. He added it would take West Coast refiners 2 years to build the equipment to meet the restriction.

Los Angeles motorists also would have to dig deeper to keep the family car running. It's estimated that such an olefin cut would add 1 cent a gallon to the price of motor fuel. That adds up to an extra cost of about $50,000 daily for Los Angeles' 3,100,000 car owners.

The olefin curb was recommended to the Los Angeles County Board of Supervisors. The board scheduled a meeting for June 16 to hear the oil industry's side of the story. Refiners previously have taken issue with APCD's claims that olefins are major contributors to smog.

Speaking for the APCD, Dr. Leslie A. Chambers told the board of supervisors 5 years of research indicated:

. . . **Olefins** in the atmosphere cause eye irritation, reduce visibility, and damage plants.

. . . **The amount** of olefins in auto exhaust is directly related to the amount of olefins in the fuel.

. . . **Reducing olefins** in gasoline will reduce olefins in auto exhaust and reduce the symptoms of Los Angeles' smog.

Dr. Chambers admitted that this olefin-reducing measure would not reduce total smog, but he said it would increase visibility and reduce the chances for eye irritation and plant damage. He also said that an afterburner or other exhaust device will still be needed to do the job thoroughly.

Dr. Chambers estimated lowering the olefin percentage to 12.5 would eliminate 150 of the 1,000 tons daily of hydrocarbons currently being contributed to the air by motor vehicles. He admitted that even with totally non-olefinic gasolines, the combustion process of an engine would form a certain amount of olefins which would be present in the exhaust.

Dr. Chambers said it also reduces losses from evaporation as well as materially cut down on olefins in auto exhaust. On hot days, he said, evaporation losses contribute almost as much olefins to the atmosphere as does the auto exhaust.

By adopting the 12.5% rule, Dr. Chambers estimated, olefin emissions in the basin could be reduced by 1960 to only slightly above the pre-smog level of 1940. If a 90% effective exhaust device could also be installed on basin vehicles, the 1940 smog level could be maintained until 1985, he said.

**Industry opposed** . . . Oil-industry spokesmen have declared previously that the condition of the auto itself has as much effect on smog as does the fuel it uses.

The Air Pollution Foundation at Stanford Research Institute flatly declared "any practical and economic change in the composition of gasoline used in Los Angeles would not be an effective method of alleviating eye-irritating, ozone-forming smog" (OGJ, May. 30, p. 106).

**Another problem** . . . The threatened restriction on olefins wasn't the only smog problem confronting Los Angeles refiners last week.

A rule which bans burning fuel oil containing more than ½% sulfur in the Los Angeles Basin went into effect last Friday. From then until September 30 natural gas will take over a market formerly served by 5 million barrels of fuel oil. Next year the ban will be extended from April 1 to October 30.

Effect of the rule will be to force refiners to seek markets elsewhere for the fuel oil.

# *PROCESSING BRIEFS . . .*

**Synthetic rubber** is off to a good start this year. First-quarter consumption was 271,684 long tons, compared with 204,748 in the same period last year, a 32.7% increase. Production was 322,057 tons the first 3 months this year, compared with only 268,998 for the same period last year. The Rubber Manufacturers Association reports that synthetic's share of the total domestic rubber market is now 64.5%, compared with 63.6% for the first quarter last year.

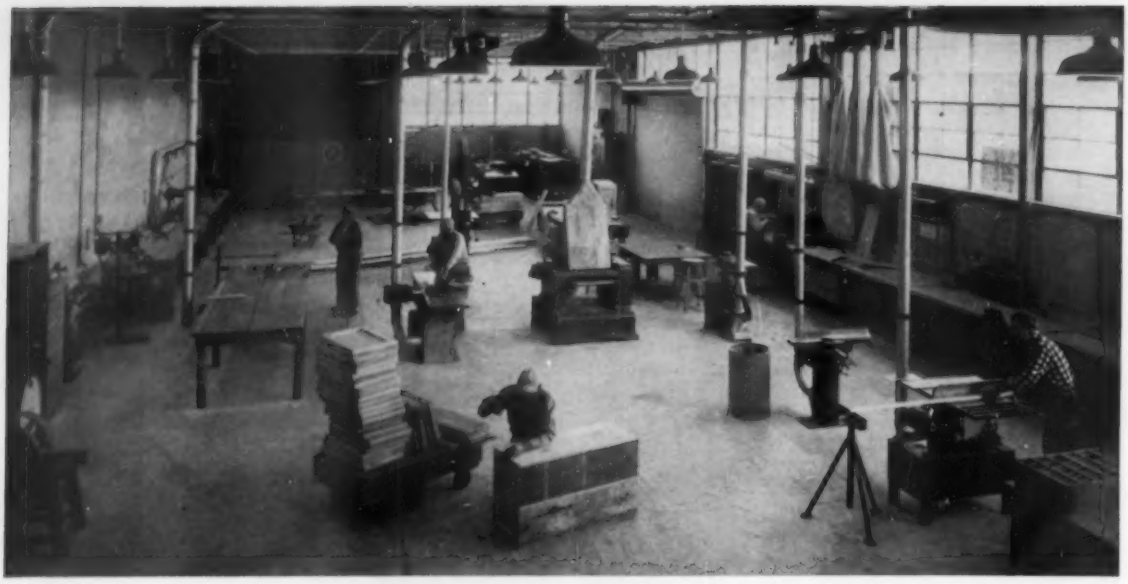
**A 7,000-bbl. Houdriformer** has been placed on stream at Texas City Refining's plant in Texas City, Tex. Its three catalytic reactors will process a wide variety of naphtha feed stocks to produce high octane gasolines. Houdry Process handled process design and Catalytic Construction the engineering and construction.

**Polyethylene capacity** at Texas Eastman Co.'s Longview, Tex., plant will be increased from 85,000,000 lb. to 100,000,000 lb. annually. New facilities will be completed by June 1. Recent additions to the OXO facilities have also boosted capacity for aldehydes to 125,000,000 lb. annually. The company is a division of Eastman Kodak Co.

**Headquarters** of Texas-U. S. Chemical Co. will be moved from New York to Port Neches, Tex., in June. The company, jointly owned by Texaco and United States Rubber, operates a synthetic-rubber plant in Port Neches and has half ownership in the world's largest butadiene plant there. The sales staff will remain in New York. Research and technical labs will be maintained at Parsippany, N. J.

## *Also for Refiners . . .*

**IN THE NEWS:** Increased demand for products, especially gasoline, has been a chief factor in the oil industry's bright first-quarter profits record (p. 59) . . . Venezuela is unhappy at new imports rules favoring Canada and Mexico (p. 62) . . . Rock Island Oil & Refining has purchased interests in Great Northern Oil Co., two pipelines, and an oil purchasing firm (p. 67) . . . Los Angeles refiners face threat of spending $60 million on new equipment if olefin content of gasoline is ordered reduced (p. 75).



**CARPENTER SHOP** is one of eight shops of Sun's Marcus Hook "mechanical center."

# 'Mechanical Center' Saves Sun Money

- Both labor and management like this new concept in refinery maintenance being tried at Sun's Marcus Hook refinery. Seven crafts are grouped under one roof. The result: Jobs are done better and faster.

SUN OIL CO. has raised the efficiency and lowered the cost of maintenance at its 160,000-bbl. per day refinery at Marcus Hook, Pa.

The principal "tool" in this accomplishment is its big, new mechanical center where seven crafts are brought under one roof in the main building.

The center is a 150-ft. by 390-ft. single story structure. Sun says it results in "more functional facilities and better working conditions."

Neither the improved efficiency nor the lowered cost are readily measurable. But their refinery management can see at least two clear-cut advantages:

... **Many jobs** are done better and more quickly.

... **Some jobs** are now done in the center which formerly were contracted outside.

**Why the switch . . .** Here are some of the benefits Sun sees as a result of putting its seven crafts under one roof.

... **It saves time** in making work assignments. Men now check in at one point. They get their assignments when they start to work instead of waiting until a foreman arrives at the job.

... **It eliminates delays** in moving equipment about the refinery. All equipment needed on a job is at hand; no job is held up waiting on tools.

... **Use of equipment** is greatly improved, since different jobs are done side by side instead of being spread over the refinery.

... **All crafts** are immediately available for any job. There is no waiting, if a particular craftsman is needed, until he has been reassigned.

... **More maintenance** work is now done under cover. This eliminates delays due to bad weather.

Approximately 1,200 men are assigned from the center. They enter through a multi-gated, IBM-equipped time office according to their craft. They receive assignments for the day from the coordinator's office, get their tools and are taken to job sites in jitneys. Exceptions are those working on shutdowns. They report directly to the job until it is completed.

The refinery is divided into four zones. Each has a crew of about 50 men, representing all crafts, which is permanently assigned there. The crew handles all run-of-the-mill maintenance work in its area.

**Acres of shops . . .** The center's 58,000 sq. ft. of floor space is divided between shops and offices. Approximately 50,000 sq. ft. is devoted to shops and the rest to offices and access ways.

The center houses these shops:

Machine, pipe, sheet metal, welding, boiler, carpenter, insulator and bricklaying. It also contains a tool room, the offices, and separate clothes and tool lockers for the workmen.

Wings of the main building house the rigging rooms and the truck-repair shop. Adjacent buildings provide for the electric, paint and bottle washing shops and nine other mechanical department facilities.

Each foreman has his own centrally located office. Lockers for administrative personnel and two small conference rooms are above the offices. Conference rooms are used primarily for huddles on turnarounds and shutdowns.

**Equipment flexible.** The center is di-

vided into bays and each has its overhead crane. Six cranes are 5-ton and the seventh, serving the boiler shop, is a 10-ton unit. There are approximately 40 fork-lift trucks to carry work to and from the center.

Oxygen, acetylene and propane, are piped in from outside storage and are distributed and available throughout the center. Three skylights run the length of the building. Overhead mercury-vapor and flourescent lighting is in use.

Tool rooms are divided into two sections. One dispenses tools, the other repairs them. Tools can be delivered either by the regular delivery service or, if the need is urgent, they can be rushed in one of two pickup trucks to the job.

Gigantic positioners are in the welding department. They hold the piece to be welded at the proper height and position most convenient to the welder. A special area for repair of welding machinery is nearby.

A throwback to the horse-and-buggy days is the blacksmith forge in the boiler shop.

There are nine operating lathes in the machine shop, two shapers, a milling machine, two radial drill presses and a 60-in. dual band saw. The saw can handle up to ⅝-in. plate at 30 inches per minute.

A 75-ton hydraulic forcing press is a key piece of equipment. Another is a balancing machine for motors.

**Multi-purpose tools . . .** There is a spray room and a precision lapping machine section. Work parts, such as compressor pistons, are built up and then machined. New metal is sprayed on the worn areas.

In concentrating the intricate work in the precision shop, Sun not only saves time which would be needed in sending equipment outside the plant, but foremen say the reworked parts are stronger and will give longer service than the original.

The bottle washing room has a tricky and efficient device for cleaning rubber gloves, inside and out. Dust doesn't have a chance in the carpenter shop. It's collected from all machines, blown to bins outside the building and the bins are carted away and dumped.

The new center was started in 1956. The machine shops were erected in 1957 and the central section was added last year.

The Marcus Hook management isn't stopping here. A new area now is being prepared for cleaning exchange bundles. Other additions and expansions are in the talking, the planning and the longer-range consideration stages.

# Third Giant Gas Well Finaled

## . . . in West Texas' Emperor field. Biggest of trio has flow potential of 843,000 M.c.f. daily from three pay zones.

THE GULF COAST had best look to its gas laurels. West Texas has come up with a big one in Emperor field of Winkler County.

With Humble Oil & Refining Co.'s recent completion of the 1 Brown & Altman Gas Unit 7, Emperor now boasts three wet-gas wells with open-flow potentials between 445,000 M.c.f. and 843,000 M.c.f. daily. Production is from Devonian, Ellenburger, and Fusselman.

Prospects are that the field will come up with more giant wells before it is fully defined.

Emperor was discovered in 1955 by J. C. Barnes, Midland independent operator. Discovery well was his 1 Brown & Altman.

Early wells had potential flows up to 200,000 M.c.f. daily. The first of the king-size producers was brought in by Pan American Petroleum Corp. in November last year.

Pan Am's 14 E. E. Brown R/A "E" in Section 5, Block B-11, PSL Survey, the Fusselman discovery for the field, was completed for a total open-flow potential of 843,000 M.c.f. daily from all three formations.

The big flow came from the Devonian at an open-flow rate of 800,000 M.c.f. daily. Production was through perforations at 8,924 to 9,114 ft. The Fusselman tested at rate of 25,000 M.c.f. daily through perforations at 9,318-76 ft., and the Ellenburger 18,000 M.c.f. at 11,279-11,307 ft.

Early in March, Pan Am came up with a second big producer from the Devonian and Ellenburger in its 1 Hendrick Operating Area "A" in Section 40, Block B-5, PSL Survey, 3 miles northeast of Wink.

This time the Ellenburger was the prolific zone with an open-flow potential of 550,000 M.c.f. daily from 11,405-15 ft. Open flow from the Devonian was 220,000 M.c.f. per day for a total potential of 770,000 M.c.f. from perforations at 9,100-9,235 ft.

Combined distillate production at open flow was figured at over 9,700 bbl. daily.

Humble followed through with its big producer, the 1 Brown & Altman Gas Unit No. 7 in Section 15, Block B-5, PSL Survey, early in April. This one, on the eastern edge of the field, was finaled for a calculated open-flow potential of 445,000 M.c.f. daily through Devonian perforations at 9,280-9,430 ft.

**EMPEROR FIELD** has added much luster to an old shallow producing area. With the exception of Keystone, most of the old pay is from the Permian.

**Area growing . . .** Emperor produces from one of the oldest producing areas in the Permian basin.

It is surrounded by shallow wells in Hendrick field producing from Permian sands at 2,400-3,100 ft. More than 350 shallow wells have been drilled in the Hendrick area since 1936.

Emperor gas, however, comes from a deep anticlinal structure trending northwest-southeast and bearing no relationship to older production. Development drilling now has proved up a producing area about 5 or 6 miles long and 3 miles wide.

The Devonian reservoir is by far the field's largest and most important. The Ellenburger pay is restricted to the crest of the structure. Likewise, the Fusselman is not expected to become a large pool.

The Devonian, though expected to spread substantially in coming months, is not expected to become a really large field in area. It is not yet definitely defined in any direction. But there are dry holes a few sections away in several directions. And The Texas Co.'s 1 Thomas in Section 18, the easternmost completion, made some water.

Acreage holdings in the field are widely distributed with no one firm having very much. Pan Am is likely the biggest with four or five sections. Others include Humble, Texaco, Phillips Petroleum Co., Champlin Oil & Refining Co., and Pure Oil Co.

Field-gas production is gathered by West Texas Gathering Co., for resale to El Paso Natural Gas Co.

A Journal
SPECIAL
REPORT
No. 4

**AN INTERESTED** and important visitor at the Arab Oil Congress in Cairo was U.A.R. President Gamal Abdul Nasser. Explaining a display to President Nasser is Sir Philip Southwell, chairman of Kuwait Oil Co.

# Arabs Leave No Doubt They Want a

- There is nothing new in the demands made by the officials of the foreign producing countries. But the Cairo conference gave them a chance to get in writing an outline of what may determine future foreign oil policies.

**Paul E. Swain**
International Editor

**CAIRO**—A hundred western oil men packed up and began leaving Cairo last week, many of them with the vaguely uneasy feeling that the first Arab Oil Congress had ended too easily.

The westerners, Americans, British, and Venezuelans, came to Egypt as observers at the first full-fledged attempt of the Arab world to hold an oil conference on a technical level. The Americans and British came expecting to be clobbered with Arab complaints about existing conditions in the oil industry. They were set for renewed demands for basic changes in favor of the Arab countries.

The complaints were all voiced—repeatedly, but the final mildly-worded resolutions contained little that hasn't been heard before.

The one difference is that they are no longer just vocal complaints. They're now a matter of record of the first Arab meeting of its kind—the handwriting on the wall.

It wasn't a meeting of desert Bedouins in flowing robes. An Arab burnoose was as rare here as it probably will be in New York next month at the World Petroleum Congress. This was a group of western-clad, often fumbling, but serious Arabs who say with every breath they want a bigger part in their oil industry.

The final resolutions reflected a deliberate effort on the part of the delegates to write them without any of the bitter sting that was half-expected by western observers. They are vaguely worded, but their import is pretty clear. One was explicit. It recommends holding a congress like this every year.

This came the day after President Gamal Abdul Nasser of the United Arab Republic (Egypt-Syria) suggested the same thing.

Here are the major points on which the delegates say they agree:

... **More active** participation in the industry "on a reasonable and equitable basis" for the producing countries.

... **Integration** of the Arab oil industry.

... **National oil companies** to operate side by side with the private companies. This reflects the thinking of the Venezuelan delegation, headed by Juan Pablo Perez Alfonzo, the new Minister of Mines and Hydrocarbons.

... **Coordination** of conservation, production, and exports of oil on a "national" level. To many Arabs today this means the entire Arab world The machinery for this coordination would, according to the resolutions, take into "account in all these matters the conditions prevailing in each country."

... **Regular exchanges** by governments to coordinate and "harmonize" their "approaches and actions" and to contribute to the steady and regular flow of oil into "international markets."

... **No price changes** without producing companies first talking the whole matter over with the governments of the producing countries concerned.

... **Increased refining** capacity in the oil-producing countries. This one ties in very closely with Arab aspira-

## *Nasser signs in at Cairo*

WHEN President Nasser visited the First Arab Oil Exhibition in Cairo one of his stops was at the official visitors' book, an essential at any official Arab function.

Here's what he wrote:

"The First Arab Petroleum Congress and Exhibition held by the League of Arab States mark the advent of collective scientific research between the Arabs for their own good as well as humanity at large. The holding of the Congress in itself is a valuable gain as it opens the way for all parties, producing countries and operating companies alike, to express their views and discuss them constructively, thus providing an invaluable opportunity to establish understanding and cooperation.

"It is my hope that this Congress continue to be held every year for the benefit of everybody.

"I extend my thanks to the General Secretary of the Arab League for his efforts and to all those who took part in this work.

"May God reward your endeavors with success."

President Nasser signs the visitors' book at Cairo. Looking on, left to right, are Abdul Hassuna, Arab League secretary general; Mohamed Salman, Arab Petroleum Congress secretary general; and Abdul Latif Bagdady, Arab League assistant secretary general.

# Bigger Share of Profits

tions for an integrated rather than merely a producing oil industry.

. . . **Petrochemical** industries for the producing countries.

. . . **Institutes and centers** to train national technicians for all jobs connected with oil activities.

The list of resolutions said the delegates wanted to "seize the opportunity" to outline the importance they "attach to" the Arab pipeline project proposed by Sheikh Abdullah Tariki of Saudi Arabia. They expressed less enthusiasm for the proposal of Lebanese millionaire contractor Emile Bustani for a development bank for oil transit countries financed by 5% of the gross profit from the producing countries. This they recommended be referred to the Arab League.

**The exhibition . . .** The accompanying oil exhibition, slated to remain open for another week, has so far been far from a huge success by western standards.

European equipment suppliers and companies operating in the Arab world have an estimated $6 million in equipment and exhibits on display. The oil companies were invited by the governments with which they deal to provide the exhibits. They are attractive, visual, and to a large degree elementary with simplified models and movies designed to appeal to a non-oil audience.

The companies have used this opportunity to try and do what is still one of their most difficult jobs—explain the industry to the man-in-the-street. The exhibits are elaborate, imaginative, and attractive.

The only problem has been that Egyptians have shown little enthusiasm for the whole thing. Attendance at the exhibition has been sporadic at best. The admission fee of 5 piastres (slightly less than 15 cents) can be used to more advantage for food and many other things by Cairo's man-in-the-street. He just doesn't have that much interest in oil. Oil is something for governments and companies to dicker over.

The rise in attendance came the day after President Nasser attended the exhibition and spent 3 hours going through every exhibit chatting with company and equipment representatives, asking questions, and taking a marked interest in what he saw.

Cairo's Arabic papers gave the president's visit—a week after its opening—a big play, and attendance picked up almost immediately.

## Egypt Returns Shell, BP Properties

CAIRO'S Arab Oil Congress marked at least one happy occasion for two of the world's big western oil companies—they got back properties seized by the Egyptian Government almost 3 years ago.

The interests of Shell of Egypt, Ltd., Shell Chemical Distributing Co., British Petroleum, and Anglo-Egyptian Oilfields were officially released last week by the government.

Three of the four are marketing companies and Anglo-Egyptian is a jointly-owned company which both produces and refines oil in Egypt. BP and Royal Dutch-Shell each own 31% of this company and the government holds the remainder.

Anglo-Egyptian operates the 44,000-bbl. Suez refinery, Egypt's largest, and Ras Gharib and Hurghaba fields which produce about 20,000 bbl. daily on mainland side of the Red Sea.

The properties were sequestered after the British-French-Israeli invasion of Egypt almost 3 years ago. Return of the companies has been expected since the United Arab Republic and British Governments settled counter claims for damages.

The return agreement was signed last week by Abdul Latif Ezzat, custodian of the properties for Egypt, and Frederich Henreich Frangenheim, representing Shell.

# Output Hits New High

## . . . in free world as Venezuela production passes 3,000,000-bbl.-daily mark for the first time.

CRUDE production in the free world in February rose to an all-time high for the fourth month in a row.

Venezuelan producers helped boost the total by averaging more than 3,000,000 bbl. daily for the first time in the country's history. Thus, Venezuela has added a million barrels to the daily production rate in slightly more than 4 years. The 2,000,000-bbl. mark was reached late in 1954.

Middle East countries had an over-all gain of 57,000 bbl. daily. But this level was short of the September record. U. S. operators produced 36,000 bbl. daily less, but Canada continued to improve.

The gradual decline curve in Austria is still clouding the country's industry. Output is now below 50,000 bbl. daily. Production in Italy returned to near normal, after being cut in half the previous month.

**TREND OVER THE LAST YEAR**

| | Western Hemisphere less U.S. | Middle East | Total Free World outside U.S. |
|---|---|---|---|
| **1958** | | | |
| February | 3,800.5 | 4,060.7 | 8,659.2 |
| March | 3,672.6 | 4,243.0 | 8,631.3 |
| April | 3,613.5 | 4,109.2 | 8,528.0 |
| May | 3,582.9 | 4,087.8 | 8,468.2 |
| June | 3,678.0 | 4,156.8 | 8,654.2 |
| July | 3,777.0 | 4,247.2 | 8,832.6 |
| August | 3,828.4 | 4,334.0 | 8,971.5 |
| September | 3,769.8 | 4,535.2 | 9,120.8 |
| October | 3,891.3 | 4,482.3 | 9,177.5 |
| November | 4,037.8 | 4,472.1 | 9,309.5 |
| December | 4,119.9 | 4,446.2 | 9,371.4 |
| **1959** | | | |
| January | 4,311.6 | 4,369.3 | 9,449.5 |
| February | 4,440.3 | 4,426.6 | 9,638.5 |

## World-Wide Crude Production: Daily Average in Thousands of Barrels

| Country— | Feb. 1959 | Jan. 1959 | Feb. 1958 |
|---|---|---|---|
| **Western Hemisphere** | | | |
| Argentina | 110.1 | 110.1 | 90.7 |
| Bolivia | 9.1 | 9.1 | 10.3 |
| Brazil | 57.4 | 57.4 | 43.0 |
| Canada | 575.0 | 549.0 | 516.8 |
| Chile | 15.7 | 15.7 | 13.6 |
| Colombia | 138.1 | 138.1 | 128.2 |
| Cuba | 0.4 | 0.6 | 1.1 |
| Ecuador | 9.0 | 9.0 | 8.7 |
| Mexico | 265.5 | 265.5 | 249.5 |
| Peru | 54.3 | 54.3 | 53.1 |
| Trinidad | 109.8 | 108.0 | 99.2 |
| Venezuela | 3,095.9 | 2,994.8 | 2,586.3 |
| Total | 4,440.3 | 4,311.6 | 3,800.5 |
| **Europe** | | | |
| Austria | 48.3 | 48.3 | 56.7 |
| France | 28.3 | 27.6 | 26.9 |
| West Germany | 92.6 | 90.6 | 84.4 |
| Italy | 27.6 | 15.0 | 24.4 |
| Netherlands | 34.6 | 34.6 | 31.8 |
| United Kingdom | 1.7 | 1.7 | 1.6 |
| Yugoslavia | 9.6 | 9.4 | 8.1 |
| Total | 242.7 | 227.7 | 233.9 |
| **Middle East** | | | |
| Bahrain | 45.1 | 45.5 | 35.6 |
| Iran* | 829.0 | 834.0 | 768.0 |
| Iraq† | 807.1 | 809.9 | 605.4 |
| Israel | 2.0 | 2.0 | 1.2 |
| Kuwait | 1,342.3 | 1,404.2 | 1,341.0 |
| Neutral Zone | 106.2 | 106.2 | 78.1 |
| Qatar | 176.4 | 167.0 | 163.1 |
| Saudi Arabia | 1,112.0 | 994.0 | 1,063.0 |
| Turkey | 6.5 | 6.5 | 5.3 |
| Total | 4,426.6 | 4,369.3 | 4,060.7 |

| Country— | Feb. 1959 | Jan. 1959 | Feb. 1958 |
|---|---|---|---|
| **Other Asia** | | | |
| British Borneo | 104.6 | 104.6 | 109.4 |
| Burma | 10.5 | 10.5 | 7.3 |
| India | 8.5 | 8.5 | 8.6 |
| Indonesia | 290.0 | 300.0 | 345.4 |
| Japan | 7.3 | 7.0 | 7.0 |
| New Guinea | 5.1 | 5.1 | 5.8 |
| Pakistan | 5.9 | 5.9 | 5.9 |
| Total | 431.9 | 441.6 | 489.4 |
| **Africa** | | | |
| Algeria | 11.4 | 14.3 | 3.8 |
| Angola | 2.0 | 2.0 | ... |
| Egypt | 62.2 | 63.8 | 60.0 |
| Gabon | 13.1 | 11.6 | 6.2 |
| Morocco | 1.7 | 1.5 | 1.6 |
| Nigeria | 6.6 | 6.6 | 3.1 |
| Total | 97.0 | 99.8 | 74.7 |
| **Free World** | | | |
| Foreign | 9,638.5 | 9,449.5 | 8,659.2 |
| United States | 7,187.0 | 7,223.0 | 6,809.0 |
| Total | 16,825.5 | 16,672.5 | 15,468.2 |
| **Communist Countries in Soviet Orbit** | | | |
| Romania | 235.0 | 235.0 | 225.0 |
| Russia | 2,300.0 | 2,300.0 | 2,260.0 |
| Others | 60.0 | 60.0 | 60.0 |
| Total | 2,595.0 | 2,595.0 | 2,545.0 |
| **WORLD TOTAL** | 19,420.5 | 19,267.5 | 18,013.2 |

*Includes estimated 5,000 bbl. daily from Naft-i-Shah field not operated by consortium companies.

†Includes estimated 3,300 bbl. daily from Naft Khaneh field, operated by Iraq Government.

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking.

# Foreign Holdings No Bonanza

## . . . right now, according to New York's First National City Bank. High costs of refining and marketing are cited.

SOME COMPANIES with new foreign crude will face hard choices, in the opinion of First National City Bank of New York.

William S. Evans, economist in the bank's petroleum department, has looked over Eastern Hemisphere prospects, and his conclusions are not cheerful. They help explain the heated objections of some companies to import restrictions.

Evans' study covered the Eastern Hemisphere. But the shoe could easily fit some newcomers to Venezuela with heavy investments in new crude supplies. These firms may be squeezed on their foreign operations unless they can work out a profitable crude exchange or have a marketing tie-in.

He predicts that many operators who have gone abroad will have to decide whether to sell out their crude interests, merge, or hold on through lean years.

"These are hard choices, but many new producers will have to make them," he said. Here's why:

. . . **Almost prohibitive costs** stand in the way of companies who want to develop foreign refining and marketing organizations.

. . . **Glum prospects for** returns on nonproducing investments await companies which might afford to take the plunge.

. . . **Payouts on new oil** fields with slim market outlets may be no longer satisfactory where a substantial investment was made in relation to the value of the crude.

The Evans' study indicates that newcomers may be hit hardest by low prices and oversupply. The hope for individual companies is that volume may compensate for a per-barrel decline in profits. But it is the majors, with existing marketing organizations in foreign areas, which are able to take advantage of heavy volume.

**$3,000 to sell 1 bbl. . . .** Companies wanting to break into foreign marketing face fearsome costs. Engineering estimates of the cost of building an integrated transportation, refining, marketing organization in the Eastern Hemisphere range from $2,100 to $3,836 per bbl.

Howard W. Page, a director of Standard Oil Co. (N. J.) recently estimated a $3,000-bbl.-per-day investment is needed to develop markets. In other words, a producer with 10,000 bbl. daily of crude available would have to invest $30 million to compete with established marketers on a retail level.

Companies willing to make the marketing investment then face a probable loss on their nonproducing operations. The Evans study estimates the seven major companies have $6.7 billion tied up in nonproducing facilities and working capital in the Eastern Hemisphere. Last year these operations took a loss of $260.1 million.

**Low product prices . . .** Newcomers with a marketing tie-in still face low profits on products. Refiners in Northwest Europe, the biggest Eastern Hemisphere market, are competing vigorously with each other, with Caribbean imports, and to some extent with coal.

Independent, established marketers in Europe, for example, can now charter tankers at spot rates that enable them to bring in products cheaper than companies with extensive long-term charter contracts. However, this situation is considered temporary.

In March, an importer with a spot-charter tanker could bring in Caribbean regular gasoline at a laid-down price of 10.7 cents per gallon. This compares with 11.3 cents per gallon on an average freight rate assessment (AFRA), which is an average cost of long-term charters and spot rates over an extended period. Caribbean No. 6 oil could be brought in for $2.35 per barrel in a spot-charter tanker, compared with $2.80 AFRA.

Two moves by major companies last week, however, made clear that established operators are hopeful. Gulf Oil Corp. predicted that despite oversupply and price weakening, the net from its foreign business would probably be good in 1959.

British Petroleum Co. revealed a major new marketing investment by unveiling the BP sign on 1,300 selling outlets in northern Italy. The stations had been held by local firms in which BP acquired majority interest. Previous BP marketing in Italy was limited to avgas and bunkering.

# Shell Bids for Full Ownership

## . . . of Canadian Eagle in $300-million stock deal to gain a bigger slice of Latin American and European markets.

ROYAL DUTCH-SHELL is making a $300-million stock bid for complete control of Canadian Eagle Oil Co., Ltd.

The move, if successful, will give Royal Dutch a firmer grip on transportation, refining, and marketing operations in areas where it for years has worked jointly with Canadian Eagle.

Shell now holds 21% interest in the Canadian-based holding company, which ironically neither owns property nor does any business in Canada.

The British-Dutch oil giant is offering three "Shell' Transport & Trading shares plus two Royal Dutch shares for 12 shares of Canadian Eagle.

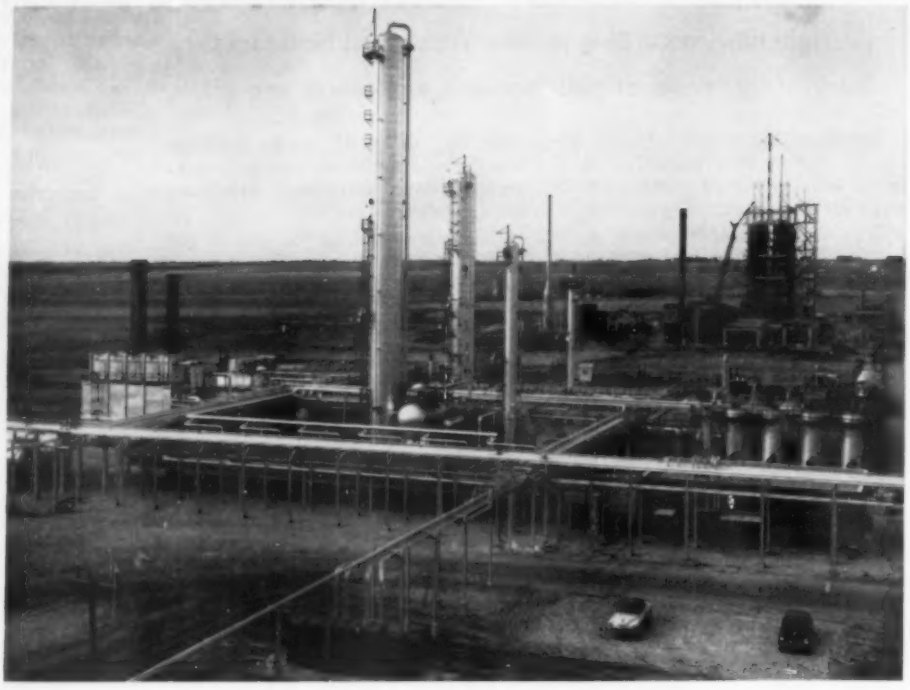
Stockholders will vote on the proposal at a meeting to be held no later than July 31. If they approve, and government and other approval is obtained, Canadian Eagle will be dissolved.

**What's involved . . .** Shell, by absorbing Canadian Eagle, will get complete control of a market for more than 80,000 bbl. daily of products now sold jointly in Latin America.

It will also strengthen its grip from 44% to 60% in Shell - Mex and BP Ltd., which markets a similar amount in United Kingdom and Ireland. British Petroleum holds the remaining 40%.

Refining interests of Canadian Eagle include half interest in the 28,500-bbl. Shell plant in Cuba and part ownership in a 39,600-bbl. refinery under construction in Ireland. The company also holds 39.5% interest in Starhaven, a company which owns asphalt plants at three of Shell's British refineries.

The company also has a tanker fleet of 347,000 tons, with 255,000 tons under construction and another 414,000 tons under long-term charter. It has access to crude supplies of more than 90,000 bbl. daily through long-range agreements for Kuwait crude, with Mene Grande Oil Co. for Venezuelan crude, and through 40% ownership in Shell-Condor S. A. in Colombia.



**EXTENSIVE** air cooling is employed for the Skelly Oil Co. HF alky unit. Note deisobutanizer overhead aerial condenser in left foreground. Feed driers are in right foreground and the reactors are on right end, grouped with other acid equipment. Delayed-coker construction is in background.

# Skelly's new HF alky unit points some trends

1. Extensive aerial cooling used successfully; depropanizer is located ahead of deisobutanizer to reduce corrosion.
2. Shell-and-tube reactors prove out in practice with only 5° F. water temperature rise through tubes.

BY DONALD E. PHELPS
Skelly Oil Co., Tulsa,
AND JOHN C. REIDEL
The Oil and Gas Journal

THE LONG-STANDING water-shortage problem in the El Dorado, Kans., area prompted Skelly Oil Co. to incorporate aerial cooling on a large scale in the design of its new 3,500-bbl. per day HF alkylation unit. All condensers in the alkylation plant are air-cooled, with the exception of the relatively small acid-rerun condenser. A total of 70 M.M.B.t.u. per hour is thus handled by aerial cooling.

• **This alky unit,** built under Phillips Petroleum Co. license, and with design, material purchase, and construction by Skelly, is also one of the first to use modified shell-and-tube exchangers as reactors. Operating experience to date has shown that this is a fully satisfactory design. Closer spacing of crossbaffles is used to insure good mixing. But this is no fancy design; modification from standard shell-and-tube is not great and the reactors are cheaper and simpler to operate. Estimates of reduction in capital cost range up to 40-50% for this type of reactor as compared with the more conventional, impeller-equipped reactors. Certain maintenance problems are eliminated and lower maintenance costs are expected.

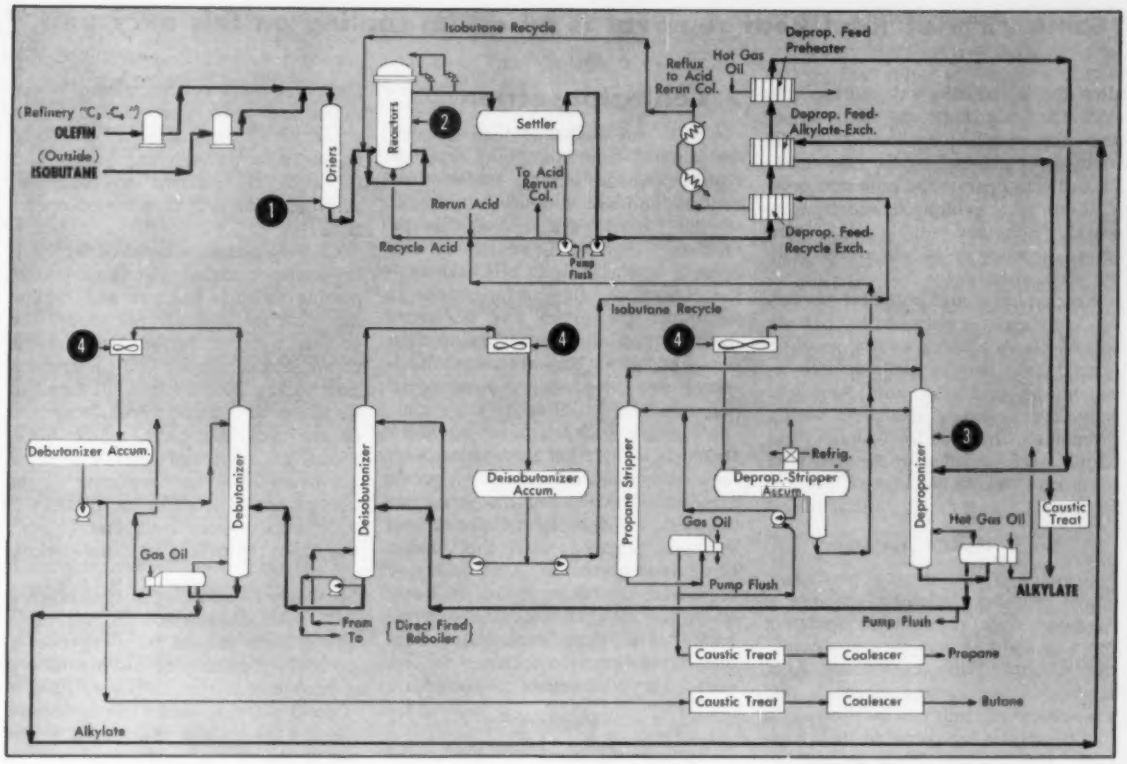
• **The extensive use** of aerial cooling led to a major change in the conventional fractionation scheme. The depropanizer is placed ahead of the deisobutanizer. This has a threefold advantage: (1) the deisobutanizer can be operated at lower temperature and pressure to minimize possible corrosion in the large (air-cooled) deisobutanizer condenser, (2) all but a trace of the HF is removed ahead of the deisobutanizer, and (3) a utility savings results since the propane in the reactor effluent need be vaporized and condensed only once.

## 1. Balancing alky-unit feed

Skelly's El Dorado refinery has a crude throughput capacity of 45,000 bbl. per day and products include a complete line of fuels, special solvents, road oils, and asphalt. Processing in-

TABLE 1—FEED COMPOSITION

| | Barrels per day | |
|---|---|---|
| | Refinery "$C_3$-$C_4$" stream | Outside isobutane |
| $C_2$ | 3 | 1 |
| $C_3$= | 681 | .... |
| $C_3$ | 984 | 25 |
| $iC_4$ | 986 | 1,329 |
| $C_4$= | 1,141 | .... |
| $nC_4$ | 510 | 40 |
| $C_5$ | 15 | .... |
| | 4,380 | 1,395 |




**HF ALKY UNIT** employs: (1) three feed driers, two of which are in operation in series (one drying and one guarding) while the third is being regenerated; (2) shell-and-tube reactors of which there are three operated in parallel; (3) depropanizer ahead of deisobutanizer to utilize aerial cooling most advantageously, and (4) aerial cooling on a large scale, totaling 70 M.M. B.t.u. per hour.

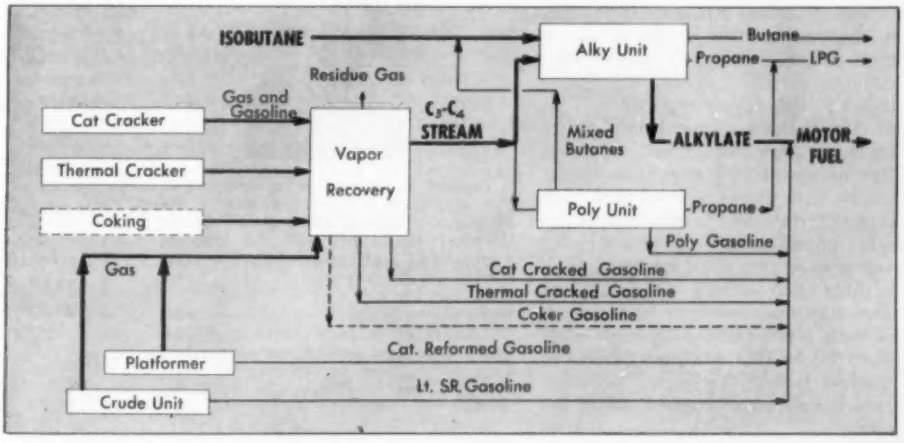
cludes crude distillation, catalytic and thermal cracking, catalytic reforming, asphalt manufacture, catalytic polymerization, and now the new HF alkylation unit. The current construction program also includes a new delayed-coking unit. Tie-in of the alky unit with the cat poly and other processing is indicated in the box-flow diagram.

In the present operation, a mixed olefin feed is being alkylated. Table 1 is typical of the current olefin and isobutane feeds when producing 3,500 bbl. per day of total alkylate.

At the 3,500-bbl. per day operation, the following properties are reported for the total alkylate:

| | |
|---|---|
| Gravity, °API | 70.7 |
| R.v.p. | 6.1 |
| Corrosion | Neg. |
| ASTM distillation, °F.: | |
| I.b.p. | 109 |
| 10% evap. | 167 |
| 20% evap. | 187 |
| 50% evap. | 214 |
| 90% evap. | 310 |
| End point | 413 |
| Organic fluorides, p.p.m. | 19 |
| ASTM RON: | |
| 0 ml. TEL | 92.2 |
| 3 ml. TEL | 103.0 |
| ASTM MON: | |
| 0 ml. TEL | 91.0 |
| 3 ml. TEL | 105.2 |

As shown, a portion of the $C_3$-$C_4$ stream can be fed to the poly unit. From this unit, isobutane in the form of mixed butanes could be sent to the alky unit to provide some of the isobutane requirements. However,




**NEW HF** alkylation unit is designed to make 3,500 bbl. per day of alkylate going into motor fuel. This is the capacity unit handles with poly unit shut down. Olefin-isobutane balance is maintained at present by bringing in outside isobutane.

**"Some 75% of total heat removal is by aerial cooling on this alky unit."**

after the initial alky-unit startup period, the poly unit was shut down and the total propylene - butylene stream was charged to the alky unit. Plans are to operate the poly unit only if there is a prolonged shortage in outside isobutane supply or if the future production of olefins exceeds the alky capacity.

Remainder of the isobutane needed for alkylation comes from outside sources (from Skelly's natural-gasoline operations). This is contemplated as an interim operation until sufficient isobutane is made available within the plant to balance total olefins. Facilities were provided in the unit area to unload isobutane to feed storage from either tank car or tank truck.

### Could Handle Amylenes

Primary design is for processing mixed propylene-butylene feed over a relatively wide variation in operating pressure, with worst pressure condition taken as the controlling case. However, the depropanizer in the vapor-recovery unit can be used as an olefin splitter to provide butylenes alone, if necessary, due to limited isobutane supply. On the other hand, the alky unit could also handle amylenes if desired. Alkylation of amylenes is contemplated for the future when more isobutane is made available.

### New Deethanizer

More thorough deethanization of olefin feed has been provided by means of a new deethanizer in the vapor-recovery unit. This is a 45-tray column with feed coming in at the fourth plate from the top, designed to hold ethane in bottoms down to 0.08 mole %.

### Throughput Flexibility

The capacity of the alky unit, 3,500 bbl. daily of total alkylate corresponds to the conditions when the poly unit is shut down. The design is not a tight one. For example, fractionating columns are sized so that the 3,500-bbl. per day figure represents 70% of critical flood-point capacity. Other measures have been taken to assure flexibility and easy expansion of capacity, such as use of valve-type fractionating trays and smaller-than-maximum impellers in the pumps. Control valves have been sized for about 60% of fully open position at normal flow. The alky unit has been operating at isobutane-olefin ratios in the range from 9:1 to 12:1. However, design of reactors is such that higher isobutane recycle can be accommodated, if desired.

## 2. Contactor section

Olefin and isobutane feed streams are pumped from storage by vertical-type multistage pumps, under flow control, and are combined upstream of the bauxite driers. Vertical-type multistage pumps, however, do not operate satisfactorily in HF acid service. Therefore, flow arrangement is such that the olefin and isobutane feed pumps and the recycle isobutane pumps serve as boosters to the horizontal two - stage depropanizer feed pumps.

**Driers . . .** There are three driers with lines manifolded so that two operate in series. The first in the series accomplishes the drying and the second serves as a guard, while the third is being regenerated. It is necessary to regenerate one drier every 24 hours when the alky unit is at design capacity. The drier regenerator condenser (regeneration facilities are not shown in flowsheet) is air-cooled.

### Reactors

Recycle isobutane combines with fresh olefin-isobutane feed downstream of the driers. The total hydrocarbon feed is distributed equally in volume between reactors by manually operated valves.

**Water cooling . . .** The three reactors are mounted vertically. Heat of reaction is removed by cooling water circulating through the four-pass U-tube baffled bundle extending from the top of the reactor (shell) down to a point below the hydrocarbon entry nozzles.


THE AUTHOR

Donald E. Phelps, who coauthored this article, is process engineer of the El Dorado alkylation unit of Skelly Oil Co. His start with the process engineering staff of Skelly's manufacturing department was in 1956, after receiving his B.S. and M.S. degrees in petroleum-refining engineering from University of Tulsa. Prior to and during his college period, he worked in engineering and construction at Skelly's El Dorado refinery and the Tulsa office.


Under normal operation the water valves are wide open. Design is for a rise of approximately 5° F. water temperature through the tubes, and for a 95° F. effluent (hydrocarbon-acid) temperature in summer operation.

Cooling water is supplied by cooling-tower circulating pumps. After passing through reactors and removing 12.1 M.M.B.t.u. per hour, the cooling water is further used on the rerun acid condenser and on propane and butane final coolers, alkylate, instrument air, pump flush, and isobutane recycle coolers, where it removes an additional 10.6 M.M.B.t.u. per hour. These uses represent all the cooling water needs in the El Dorado alkylation section. Note that 75% of total heat removal is by aerial cooling.

**Shell side . . .** Mixing of hydrocarbon and acid takes place in the shell. Crossbaffles are on 10-in. spacing to promote good mixing. Both shell and tubes are of carbon-steel construction. Two 3-in. side - entry lines, located toward the bottom of the reactor, are the hydrocarbon feed lines. A third 3-in. line, entering the shell at the bottom, is the recycle acid-charge line. The reactor-product effluent line is a 6-in. line located on shell side near top of reactor. The acid-service relief valves are mounted on the effluent line rather than the reactor shell. Two 12-in. water nozzles are located in the channel at the top of each reactor.

**Thermowells . . .** The idea of operating an HF alkylation reactor without an impeller has raised some questions about the temperature gradient through such a reactor and possibility of attendant polymerization. Experience with such an operation has indicated that this is not a problem. Skelly has provided thermocouples on one of the reactors at El Dorado to check the gradient. The results of preliminary measurements when the cooling water entered the tubes at 84° F. are given below:

| Distance above hydrocarbon entry (in.) | Shell-side temperature (°F.) |
|---|---|
| 228 (effluent) | 88 |
| 222 | 88 |
| 162 | 88 |
| 102 | 89 |
| 82 | 90 |
| 62 | 92 |
| 42 | 95 |
| 22 | 100 |
| 0 (HC entry) | 87 |

**Reactor operation . . .** Reactors normally operate full of acid with the hydrocarbon feed floating up through the acid. In balanced operation the amount of acid leaving the reactor in the effluent is equal to that brought in through the recycle-acid feed line; i.e., acid level is held fairly constant. Acid circulation rate (design) is approximately one-third barrel acid per barrel hydrocarbon.

### Settler

Effluent from the three reactors combine and go to a single settler which serves as an acid - knockout drum for the depropanizer feed. The acid phase separates from the hydrocarbon and settles to bottom, flowing through the acid "boot" to the acid-circulating pump. The acid is recirculated to the reactors with a slipstream going to the acid-rerun unit. A board - mounted interface - level recorder aids in determining when make-up acid should be added.

**HC phase . . .** In normal operation a constant HC level is not maintained. The settler drum is run-flooded and the hydrocarbon phase leaves the settler through a line located on top of the drum, to the depropanizer feed pumps. Discharge from these pumps is under flow control with the FRC reset by the PRC which holds the suction pressure above the vaporization pressure of the liquid handled. The depropanizer feed goes through three units of the finned-tube feed-preheat exchange: (1) feed-to-recycle, (2) feed-to-alkylate, and (3) final section using hot (550° F.) gas oil to control depropanizer feed temperature at about 150° F.

## 3. Fractionation section

In earlier designs, the alkylation unit flow used the deisobutanizer ahead of the depropanizer. However, as noted earlier, in Skelly's El Dorado design, the depropanizer was placed upstream of the deisobutanizer primarily to permit use of aerial cooling more advantageously. This flow scheme also provides an advantage in utility savings because the large volume of propane removed as a product from the unit is vaporized and condensed only one time before being yielded.

Cooling duty on the depropanizer overhead condenser is 18.1 M.M.B.t.u. per hour and that on the deisobutanizer condenser is 45.5 M.M.B.t.u. per hour, with three banks of coil sections for the former and six banks for the latter.

### Acid Leg

Main function of the acid leg in the depropanizer-stripper accumulator is to protect the large deisobutanizer condenser unit and the whole deisobutanizer system.

If the deisobutanizer were located first there would be free HF in both the deisobutanizer and depropanizer reflux drums. With the depropanizer and stripper coming first, all but a trace of the HF is removed; the deisobutanizer system is essentially free of acid.

### Depropanizer Condenser

Depropanizer overhead is combined with overhead vapor from propane stripper and is condensed in the three banks of air-cooled coils. The aerial condenser is nonstandard design with special attention to: (1) elimination of low spots so that header boxes are completely self-draining, and (2) eliminating stresses, with tubes welded in rather than rolled, and elimination of plugs. Flow is manifolded so each bank can be bypassed if a section should need replacement. Control of air flow is manual and the fans can be operated at full or half speed according to fluctuations in air temperature.

### Depropanizer-Stripper

As noted earlier, a new deethanizer was added in the vapor-recovery section. The small amount of ethane which is not removed by the deethanizer tends to build up in the depropanizer-stripper accumulator. Accordingly, a noncondensable vent is provided here with venting taking place through a riser equipped with a small refrigeration coil (cooling provided by a 3-ton Freon unit) and packed with Raschig rings to prevent HF loss. This vent operates in connection with the three-way valve and condenser-bypass pressure-control system.

Circulating hot gas oil provides reboiler heat for the depropanizer as well as propane stripper and debutanizer. Reflux rate on depropanizer is adjusted by changing the hot gas-oil circulation rate without changing side tower temperature which is maintained constant by the cascade system.

**Propane stripper . . .** This strips HF out of propane make. Stripper tower pressure is controlled at about 15 psi. above accumulator pressure to permit use of a small portion of stripper bottoms as pump flush material for the depropanizer reflux pumps. The propane make is caustic-treated to remove traces of HF and is then passed through a coalescer to eliminate caustic carryover to the propane driers. The bottoms make from the depropanizer is essentially HF-free material.

### Deisobutanizer

Accumulator level is regulated by varying fuel input to the direct-fired reboiler. With reflux and recycle isobutane flow held constant, the level in the deisobutanizer accumulator is maintained by regulating the heat input to the reboiler heater.

**Defluorination . . .** The rate of circulation through the gas-fired reboiler is regulated to hold approximately 400° F. on combined coil outlet. At this temperature organic fluorides are broken up to HF and the original organic compound. Defluorination is thus accomplished according to the more recent practice in HF alky plants.

### Continuous Analyzer

A chromatograph analyzer records the stream composition of the butane product. The isobutane content of the stream is thus continuously monitored to aid the operators in holding this "loss" to a minimum. The composition of the isobutane recycle and the shipments of outside isobutane are also analyzed and recorded by the analyzer.

### Acid-Soluble-Oil Disposal

The small amount (8 bbl. per day) of acid-soluble oil produced during the alkylation reaction is of no marketable value at the present. It is withdrawn from the acid rerun column, neutralized with ammonia, diluted with fuel oil, and then burned in the deisobutanizer reboiler and hot - oil heater.


### Acknowledgment

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# What torque on a sucker-rod joint?

## There's no definite answer but here are some helpful approaches

BY WALTER H. RITTERBUSCH, JR.
S. M. Jones Co.

SUCKER-ROD-JOINT failures have been a continuing problem to the industry, and most of these failures are due to improper makup of the threaded connections. This article will answer these questions:

- What is the optimum preload in a sucker-rod joint?
- What applied torque will produce the optimum preload?
- How is the proper torque applied?

Proper makeup has been defined as preloading the joint sufficiently to prevent separation of the pin-and-coupling shoulder face upon application of the external tensile or pumping load.

This preloading is accomplished by applying a predetermined torque to the joint, the effect being to elongate the pin and compress the coupling. The applied external tensile load further elongates the pin and at the same time, the compression load in the coupling is reduced until such time as the pin-and-coupling shoulder faces separate.

At the point of separation the compression load in the coupling is zero, and the load on the pin is equal to the applied external or pumping load.

Theoretically, in an adequately preloaded ideal bolted assembly, where the bolt size is relatively unimportant, there is little or no increase in load on the pin due to external applied load. This is true in the case of rigid bolted assemblies. But an analysis of J. O. Almen[1] shows schematically that the more elastic the bolted members are, the greater the load range applied to the pin. Likewise, the stiffer the pin is, the greater the load range.

Dimensionally, a sucker-rod joint is far from an ideal bolted assembly. There is a lack of rigidity due to o.d. limitations, and the pin is short and stiff.

These two factors combine to give a load change of some magnitude with the application of the pumping load, no matter what the preload.

Fatigue tests have shown that the fatigue strength of a metal decreases as the range of dynamic load to which the metal is subjected is increased. Conversely, as the load change approaches zero, the dynamic load that can be supported approaches the tensile strength of the metal.

Since it has been determined mathematically and experimentally that a sucker-rod joint exhibits a sizable load change in the pin with an applied pumping load, there is obviously an optimum preload something less than the yield of the sucker-rod steel.

**Optimum preload . . .** The problem of determining the optimum preload is based on several considerations: (1) the load change experienced in the pin due to the applied pumping load, (2) the ability of the joint to maintain the initial tension, and (3) the effect of the applied pumping load on tightness.

**Maintaining initial tension . . .** Sucker-rod pins, being short and stiff, with a shank larger than the thread-root diameter, exhibit very little total elongation with preload. Any seating of mating surfaces, or loss of metal due to wear or corrosion, can cause a loss of part of the preload, and subsequent fatigue failure will follow if the initial preload is near the low limit.

## Why this article?

This article was prepared to present the results of an experimental study of the stresses in a sucker-rod pin due to makeup and subsequent application of pumping load.

This study was carried out on several specimens of each size of sucker-rod joint. Makeup torque was applied by means of a mechanical worm-gear device. Torque was measured by resistance strain gages, and the external load was applied by a tensile testing machine.

The purposes of this study were to determine: (1) the torque-preload relationship for sucker-rod joints, (2) what part of the external pumping load is applied to a preloaded pin, and (3) what torque produces the optimum preload.

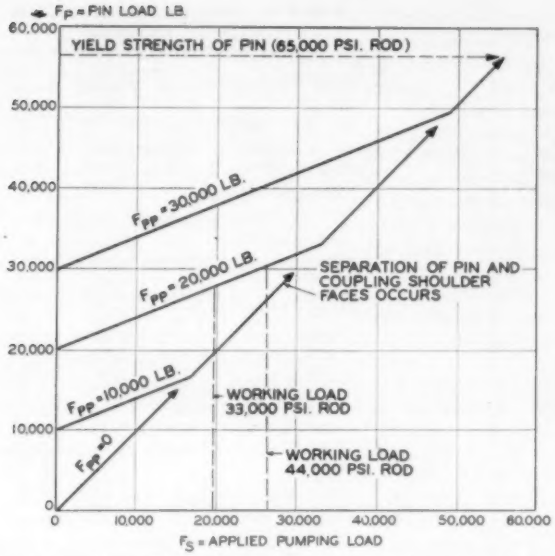
The conclusions are primarily concerned with stresses in the pin, and little mention is made of the relationship of pin to coupling failures. It suffices to that couplings carry the complete load change due to the pumping load in the unengaged threaded section between the pin ends. Practically all coupling fatigue failures start at the root of the last engaged coupling thread at the end of the pin. The only practical field correction is to reduce the stress range by increasing coupling o.d. Oversize couplings are generally available for popular sizes of sucker rods.

**Loosening effect of applied load . . .** The pumping load has a tendency to unscrew a sucker-rod joint, particularly when high pumping speeds and range of load are applied to the sucker-rod string.

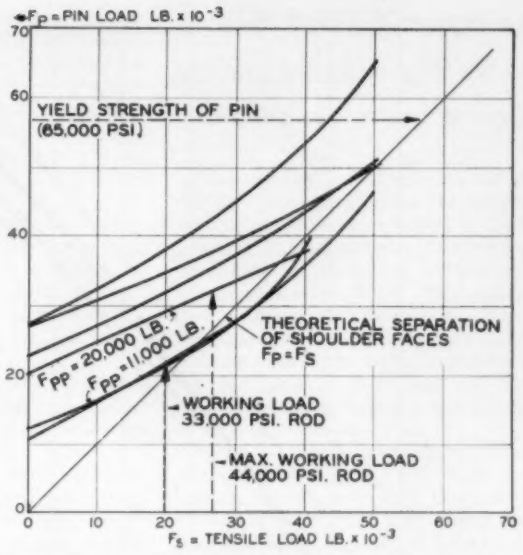
A pin thread has a helix angle upon which the coupling turns, thereby putting tension on the pin. This is a nonreversible mechanism under ordinary loads, in that pulling on the pin will not make the coupling unscrew. This is because the coefficient of friction exceeds the helix angle effect.

In high ranges of load application, the coupling and pin alternately expand and contract, and the coupling "breathes" in and out radially. This means the contacting surfaces of the pin and coupling thread faces are moving relative to each other in a radial direction.

This radial movement acts to reduce the coefficient of friction, and a slight unscrewing tendency takes place with each applied load, since the coefficient


$F_p$ = PIN LOAD LB.
YIELD STRENGTH OF PIN (65,000 PSI. ROD)
$F_{pp}$ = 30,000 LB.
$F_{pp}$ = 20,000 LB.
SEPARATION OF PIN AND COUPLING SHOULDER FACES OCCURS
$F_{pp}$ = 10,000 LB.
WORKING LOAD 33,000 PSI. ROD
$F_{pp}$ = 0
WORKING LOAD 44,000 PSI. ROD
$F_S$ = APPLIED PUMPING LOAD

**THEORETICAL RELATIONSHIP** between applied pumping load and pin load for a ⅞-in. joint. These curves based on calculated values of K. Fig. 1.


$F_p$ = PIN LOAD LB. x $10^{-3}$
YIELD STRENGTH OF PIN (65,000 PSI.)
$F_{pp}$ = 20,000 LB.
$F_{pp}$ = 11,000 LB.
THEORETICAL SEPARATION OF SHOULDER FACES $F_p = F_S$
WORKING LOAD 33,000 PSI. ROD
MAX. WORKING LOAD 44,000 PSI. ROD
$F_S$ = TENSILE LOAD LB. x $10^{-3}$

**EXPERIMENTAL RELATIONSHIP** between applied pumping load and pin load for a ⅞-in. joint. These curves were used to obtain experimental values of K. Fig. 2.

of friction is reduced below the helix angle effect.

Experimental work has proved that threaded connections can be loosened in this manner.

Sucker-rod joints, as previously stated, are subjected to load changes of considerable magnitude even when properly preloaded. And when pumping with large plungers, this breathing effect is certainly a serious factor in unscrewing and subsequent fatigue failure.

**Load Change in Pin Vs. Applied Load**

Experimentation and calculation prove that for any bolted connection

$$F_p = F_{pp} + \frac{\frac{(L_1)}{(L)}\,\frac{1 \times F_s}{}}{1 + \frac{A_c E_c}{A_p E_p}} \quad (1)$$

or $F_p = F_{pp} + KF_s$ (2)

Where $F_p$ = total pin load

$F_{pp}$ = pin load due to preload, lb.

$F_s$ = applied load, lb.

$\frac{L_1}{L}$ = geometry effect, = 1.0 for sucker rods

$A_c$ = cross-section area of coupling at major diameter, sq. in.

$E_c$ = modulus of elasticity of coupling

$A_p$ = cross-section area of pin-thread root diameter, sq. in.

$E_p$ = modulus of elasticity of pin

K = a constant between zero and one

or, the total pin load is equal to the preload by tightening plus a certain portion of the external load. The portion of the external load is independent of the initial tightening and is controlled by the ratios of pin-and-coupling cross-section.

The value $K = \frac{1}{1 + \frac{A_c}{A_p}}$ may be calculated for each pin-and-coupling size, Table 1.

**TABLE 1—CALCULATED AND EXPERIMENTAL VALUE OF "K"**

| Rod size, in. | Ap | Ac | K calculated | K experimental |
|---|---|---|---|---|
| ⅝ ..... | .508 | 1.050 | 0.326 | 0.42 |
| ¾ ..... | .678 | 1.152 | 0.371 | 0.51 |
| *⅞ .... | .873 | 1.440 | 0.377 | 0.48 |
| †1 ..... | 1.208 | 1.612 | 0.428 | 0.54 |

*1 1/16-in. o.d. †2-in. o.d.

These calculations show that from 32.6 to 42.8% of the pumping load is applied to the sucker-rod pin, depending on joint dimensions. The experimental values of K in Table 1 were obtained by experimentation with electrical resistance gages and completely instrumented sucker-rod joints.

Fig. 1 is a plot of preloads versus applied load for the ⅞-in. joint based on the calculated values of K.

A close study of Fig. 1 shows that there is no further advantage in preloading a joint beyond that necessary to prevent shoulder-face separation by the application of the pumping load.

The range of load in the pin for a given range of pumping load remains the same for all preload values above the optimum, but the mean level of the load range is increased. As an example, in Fig 1, for a 0-20,000-lb. applied pumping load, and a 20,000-lb. preload, the range of load is 8,000 lb. and the mean load level is 24,000 lb. For the same 20,000-lb. applied pumping load with a 30,000-lb. preload, the range of load is still 8,000 lb., but the mean level is 34,000 lb.

Fig. 2 shows the experimental determination of K for various ⅞-in. specimens.

Table 1 and Fig. 2 show that for the specimens covered by the experiment, which covered several types of steel and varying amounts of preload, the experimental value of K exceeds the calculated values. This means in practice the sucker-rod pin actually carries from 42 to 54% of the pumping load.

The theoretical minimum preload occurs when the elongation of the coupling by the application of the external load equals the compression in the coupling by the application of the preload, or $F_p = F_s$. Substituting $F_s$ for $F_p$ in the equation $F_p = F_{pp} + KF_s$, it can be shown that

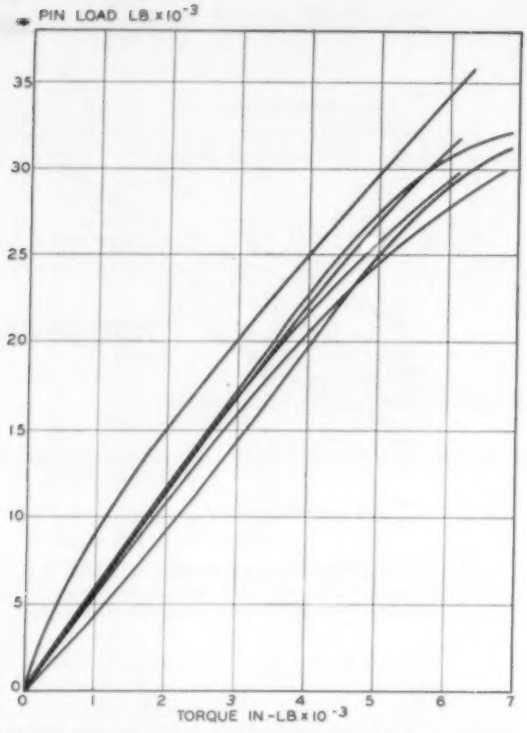
$$F_{pp} = (1 - K)\,F_s \quad (3)$$

where K = the experimental value from Table 1

$F_s$ = applied load

$F_{pp}$ = theoretical minimum preload

This equation shows that the theoretical minimum preload is never greater than the applied pumping load.




**AMOUNT OF TORQUE** required to preload a ⅞-in. sucker-rod joint is shown in this plot of tests on six different ⅞-in. rods. Fig. 3.

**TABLE 2—THEORETICAL MINIMUM PRELOAD**

| Rod size, in. | 44,000-psi. rod psi. | 33,000-psi. rod psi. |
|---|---|---|
| ⅝ | 7,900 | 5,900 |
| ¾ | 9,500 | 7,300 |
| ⅞ | 13,700 | 10,400 |
| 1 | 15,800 | 12,000 |

Since the maximum allowable working load for each size and type of rod is known, these values may be substituted in Equation 3 and the minimum preload calculated, as in Table 2.

Although the above experiments show that from 42 to 54% of the pumping load is applied to the pin on every stroke, it can also be seen from a study of Fig. 2 that there is not in practice exact adherance to the theoretical concept depicted in Fig. 1.

For this reason, plus whatever amount is necessary to overcome preload relaxation, torque-tension-ratio error, and torque-wrench error, a safety factor is suggested. For this study it is assumed that the optimum preload is equal to the allowable working load for each size and type of rod. The suggested optimum preloads are given in Table 2.

A comparison of the suggested optimum preload with the minimum in Table 2 shows that this approach indicates a 2 to 1 safety factor, approximately.

**TABLE 3—SUGGESTED OPTIMUM PRELOAD**

| Rod size, in. | 44,000-psi. rod psi. | 33,000-psi. rod psi. |
|---|---|---|
| ⅝ | 13,600 | 10,170 |
| ¾ | 19,400 | 14,620 |
| ⅞ | 26,400 | 19,900 |
| 1 | 34,300 | 26,000 |

### Necessary Torque for Optimum Preload

The problem of determining what preload is placed in a pin from the applied torque is not simple. Friction forces neutralize as much as 90% or more of the applied torque. The torque is absorbed in three general ways: 50% by the frictional resistance of the joint shoulder faces, 40% by friction between mating-thread elements, and 10% goes into producing tension or preload in the pin.

A mathematical relation of torque tension may be expressed as follows:

$$PL/W = U_b R_b + R_t \frac{\left(U_t \sec\beta + \frac{1}{2\pi N R_p}\right)}{\left(1 - \frac{U_t \sec\beta}{2\pi N R_p}\right)} \quad (4)$$

Where P = force applied to wrench, lb.

**TABLE 4— TORQUE VS. SUGGESTED OPTIMUM PRELOAD**

| 5 rod size, in. | 44,000-psi. rod— Preload reg. | Average torque ft. lb. | 33,000-psi. rod— Preload reg. | Average torque ft. lb. |
|---|---|---|---|---|
| ⅝ | 13,600 | 140 | 10,170 | 125 |
| ¾ | 19,400 | 310 | 14,620 | 235 |
| ⅞ | 26,400 | 435 | 19,900 | 300 |
| 1 | 34,300 | 730 | 26,000 | 550 |

**TABLE 5**

| Applied torque in ft.-lb. | Distance moved in inches— ¾-in. rods in. | ⅞-in. rods in. | 1-in. rods in. |
|---|---|---|---|
| 125 | 1/32 | 1/32 | 3/64 |
| 250 | 1/16 | 1/16 | 5/64 |
| 375 | 3/32 | 3/32 | 1/8 |
| 500 | 1/8 | 1/8 | 9/64 |
| 625 | 5/32 | 5/32 | 3/16 |
| 750 | 3/16 | 3/16 | 7/32 |
| 875 | 7/32 | 7/32 | 1/4 |
| 1,000 | 17/64 | 1/4 | 19/64 |
| 1,125 | 5/16 | 9/32 | 21/64 |
| 1,250 | 11/32 | 5/16 | 23/64 |
| 1,375 | 27/64 | 25/64 | 25/64 |
| 1,500 | | 7/16 | 27/64 |

L = effective length of wrench, in.
W = total preload in pin, lb.
$R_p$ = pitch radius of thread, in.
$R_b$ = effective radius of action of frictional forces on bearing surface
$R_t$ = effective radius of action of frictional forces on thread contact faces
$U_b$ = effective coefficient of friction on bearing surface
$U_t$ = effective coefficient of friction on contacting surfaces of thread flanks
$\beta$ = angle between mating faces of threads and a normal to the thread axis
N = number of threads per inch

Where N and Rp are known for any thread form.

$R_b$ = average of

$$\text{coupling} \frac{\text{o.d.} + \text{i.d.}}{2}$$

$U_b$ varies between .15 to .40 with surface finish and lubrication
$U_t$ varies between .05 and .25
$\beta$ = 30° for basic thread form; however, as load is applied, the threads bend as cantilevers, and may be 45° at high stresses.
$R_t = P_p$ approximate if threads mate uniformly

An analysis of Equation 4 shows that a relation of torque to tension exists, but that the magnitude of possible variation of any one of the several factors makes correlation difficult from one joint to another.

### Experimental Torque Vs. Tension Data

Further experimental work with electrical resistance gages has given a

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preload obtainable with a given torque on any size of sucker-rod joint.

These results, although based on too few tests to be completely reliable, are indicative of what values may be expected, and are given in Table 4 and Fig. 3.

They also bear out the fact that although there is no definite torque-tension relationship for a threaded connection, the formula $T = .2 \times A_p F_{pp}$ is reasonably accurate.

**Application of recommended torque** . . . To obtain preload consistency in highly stressed assemblies, some industries measure the stretch of the bolt, or the angle of nut turn. These methods are accurate, but difficult to apply to a sucker-rod joint in the field. The nut-turn method has been recommended for many years and it is applied by first making up a sucker-rod joint to shoulder, applying considerable wrench torque to iron out irregularities and to seat the mating parts, then breaking out the joint.

Again the joint is spun in to shoulder-face contact, a position of zero preload. The coupling shoulders are marked vertically with chalk, and then, by three or four snaps with a rod wrench, the chalk marks are moved apart a predetermined distance.

Table 5 was made experimentally by making up sucker-rod joints with a mechanical wrench, to apply predetermined torques, and the average distances the pin-and-coupling shoulders were separated was measured.

Friction forces, although varying greatly, may be reduced to some degree of uniformity by proper lubrication on the first and all subsequent

This table may be correlated with Table 4.

**Field practices in makeup . . .** Sucker-rod-joint makeup in the field is commonly done with hand wrenches. The thread protectors are removed when the rods are hanging on the elevator with little attention paid to the adequacy of thread lubricant or freedom of shoulder faces from dirt, paint, or rust. The joint is stabbed, and a wrench on the upper rod square is spun until the shoulder faces contact. The two wrenches are then hit one or two snaps, and the rods are lowered in the tubing and the procedure repeated.

As the string nears bottom, the man on the wrenches is usually tiring, and not as much wrenching effort is applied at the top of the string where it is needed the most.

This procedure, though not recommended, is satisfactory so long as joint failures are not being experienced.

It is the author's experience that it is possible to drastically reduce joint failures attributable to these malpractices.

In most cases a rag, wire brush, can of kerosine, a good zinc-base thread lubricant, and the cooperation of the rod crew are all that is needed.

Each pin is meticulously cleaned, with careful attention being paid to the pin-and-coupling shoulder face. Ample lubricant is placed on the pin and the pin shoulder face, the joint is stabbed and spun up, and should seat with a metallic ring like a tool joint.

Any joint that will not spin in should be discarded.

Makeup is then completed by hitting the wrenches of the snap variety, amply weighted and with sufficiently long handles, three or four hard snaps.

The best rod wrencher in the crew should be used for the top rods in each section, and particularly the larger-diameter rods if the string is tapered.

In some cases the coupling-turn-measurement method may be used, particularly to check the efficiency of wrenching effort. Table 5.

At best, the man with a wrench, unless using the chalk-line-measurement method, cannot provide uniform makeup torque.

The best available method of applying a uniform torque is by use of the air or hydraulic sucker-rod tongs.

Here again, unless the joints are meticulously clean and well lubricated, the torque applied cannot be correlated with preload. A word of caution on power tongs is relevant at this point. The air or hydraulic gage should be occasionally checked for accuracy. It has been observed that erroneous torque values have been applied to sucker rods because of faulty pressure gages. The mechanical condition of the power tongs is also important.

**Further precautions . . .** Care should be taken to prevent galling and seizing, which come primarily from too little thread clearance. Grinding in such a joint will raise the temperature and surely cause galling. This is primarily a manufacturing problem, and should be largely eliminated with the pending API adoption of 2A-2B thread fit for sucker rods.

**"Best means of applying uniform torque is with air or hydraulic sucker-rod tongs."**

The experimental determination of the fact that each successive torque application provides a higher preload value is indicative that considerable smoothing and seating of surfaces occur in sucker-rod joints. This means that a string of rods that has been pulled several times should have more resistance to joint failures provided the joint is kept clean and has not been subjected to fatiguing action due to improper makeup.

Further, the importance of first making up, breaking out, then remaking up each joint in a new string of rods is established. This is particularly true where pin failures have been occuring in the previous string, indicating that well conditions may exist that aggravate joint troubles.

### Conclusions

In summary, sucker-rod-joint failures are best attacked by applying the optimum preload as related to the allowable working load on the sucker-rod string.

1. These optimum preloads are presently best applied in field practice by the use of power sucker-rod wrenches to apply a recommended torque.

2. An accurate, although unwieldy method of applying the optimum preload, is by the chalk-mark method.

3. The least-accurate method, though most commonly used, is the man with the wrench.

4. By none of these methods can the optimum preload be attained unless the simple step of joint cleanliness and lubrication is first applied.

5. Although the values shown in Table 4 are the result of extensive laboratory experimental work on sucker-rod pins, the variables involved are of such magnitude that field experience in applying them should take precedence.

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BY P. O. POPE AND JOHN MESAROS
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**When wells are hot and deep, drilling fluids really get a workout. Here's the story on those three deep ones Phillips drilled in Pecos, one of them the world's deepest, in the drilling of which . . .**

# Low-solids muds score high

THIS IS A REPORT on the drilling muds used on the world's deepest well and two others nearby and almost as deep. The three wells had almost every known drilling problem. In spite of the problems, the muds did good jobs.

Basically the muds were designed and maintained as low-solids muds.

This article is a condensation of a paper titled, "Mud Programs for Deep Wells in Pecos County, Texas," presented to Southwest District, API Division of Production, meeting, Midland, Tex., March 4-6, 1959.

Driscose was the primary mud material in all three. Treatment was based on the premise that Driscose would permit a mud to remain fluid and keep good flow properties in wells that were hot and deep. The premise was proved true and it is apparent that the oil industry does have a drilling fluid for deep wells.

The three wells were drilled by Phillips Petroleum Co. in Pecos County, Texas. All three reached total depth in 1958. One of them, the 1-EE University, is the world's deepest well. The others, the 1A Montgomery and the 1A Harral, were not far behind.

In actual drilling, the only features that the three wells had in common were that they are in Pecos County and deep. Otherwise they were quite different. The blowout on the 1A Harral would have been more typical if the well had been on the Gulf Coast. The high temperatures in the Montgomery would be expected in Louisiana.

**TABLE 1—MUD PROPERTIES ON 1-EE UNIVERSITY**

| Depth, ft. | Density, lb./gal. | Funnel vis., sec./qt. | Apparent vis., cp. | Plastic vis., cp. | Yield point, lb./100 sq. ft. | Gels* Fann, lb./100 sq. ft. | Water loss, API | Cake, in. | pH | Cl, p.p.m. | Total hardness, p.p.m. as $CaCO_3$ | P Alk. ml. | M Alk. ml. | Oil (%) | Solids (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,150 | 10.2 | 36 | | | | | 75 | 4/32 | 6 | 4,125 | | | | | |
| 2,114 | 10.0 | 30 | | | | | | | | 130,000 | | | | 3 | |
| 3,039 | 9.9 | 33 | | | | | | | 6 | | | | | 3 | |
| 4,107 | 10.0 | 35 | | | | | 78 | | 6 | | | | | 6½ | |
| 5,022 | 9.5 | 35 | | | | | 74 | 8/32 | 6 | 12.8% | | | | 8 | |
| 6,035 | 9.6 | 33 | | | | | | | | | | | | 4½ | |
| 6,660 | 9.2 | 44 | 16.5 | 16 | 1 | 0-1 | 8 | 1/32 | 7 | 5,500 | | | | 8 | 7 |
| 8,677 | 9.3 | 38 | 11 | 8 | 6 | 0-1 | 8 | 1/32 | 7.2 | 1,300 | | | | | |
| 9,045 | 9.6 | 42 | 18 | 14 | 8 | 0 | 5.4 | 1/32 | 7 | | | | | 3 | 7 |
| 9,967 | 9.3 | 38 | 15 | 20 | 10 | 1-18 | 9 | 2/32 | 7 | | | | | 5½ | 10 |
| 11,084 | 10.2 | 46 | 25 | 21 | 8 | 0-3 | 6 | 2/32 | 7 | | | | | 7½ | 11 |
| 12,020 | 9.9 | 35 | 13.5 | 11 | 5 | 1-2 | 7 | 2/32 | 9.5 | 2,000 | 200 | 0.1 | 0.8 | 6 | 6 |
| 13,025 | 9.8 | 38 | 18 | 15 | 6 | 1-1 | 6.2 | 2/32 | 9.5 | 1,500 | 200 | 0.2 | 1.2 | 8 | 8 |
| 14,090 | 10.1 | 40 | 21.5 | 18 | 7 | 2-3 | 5.6 | 2/32 | 9.5 | 2,000 | 300 | 0.5 | 2.2 | 7 | 10 |
| 15,030 | 10.1 | 41 | 21.5 | 18 | 7 | 2-3 | 5.2 | 2/32 | 9 | 1,500 | 400 | 0.3 | 1.3 | 7 | 9 |
| 16,020 | 10.3 | 47 | 30 | 24 | 12 | 2-8 | 7.8 | 2/32 | 7.5 | 900 | 210 | | | | |
| 17,099 | 10.2 | 48 | 31.5 | 24 | 15 | 2-5 | 7.2 | 2/32 | 10 | | 350 | 0.4 | 1.5 | 8 | 8 |
| 18,086 | 10.4 | 48 | 29.5 | 24 | 11 | 2-15 | 9.8 | 2/32 | 11 | 1,700 | | 1.4 | 3.6 | 12 | 9 |
| 19,139 | 10.8 | 53 | 37.5 | 27 | 21 | 2-15 | 6.8 | 1/32 | 10.5 | 1,300 | | 3.7 | 8.1 | 6 | 8 |
| 20,038 | 10.2 | 48 | 35 | 27 | 16 | 3-17 | 6 | 1/32 | 10 | 1,000 | | 3 | 6.9 | 7 | 12 |
| 21,038 | 10.3 | 47 | 34 | 25 | 18 | 6-13 | 6.8 | 1/32 | 11.5 | 1,000 | | 2.2 | 4.8 | 8 | 7 |
| 22,049 | 10.2 | 48 | 34.5 | 25 | 19 | 4-12 | 5.6 | 1/32 | 11.5 | | | 2.6 | 5.7 | 6 | 9 |
| 23,048 | 9.9 | 42 | 21 | 17 | 8 | 2-3 | 8 | 1/32 | 10.5 | 1,500 | | 0.8 | 4 | | |
| 24,063 | 11.9 | 52 | 35.5 | 26 | 19 | 3-11 | 6.4 | 1/32 | 10.5 | 1,500 | | 3.5 | 8.5 | 7 | 14 |
| 25,009 | 11.9 | 70 | 48.5 | 29 | 39 | 15-25 | 8.4 | 2/32 | 10.5 | 1,000 | | 1.2 | 4.1 | 6 | 14 |
| 25,340 | 11.7 | 56 | 50 | 42 | 16 | 2-11 | 4.0 | 2/32 | 9.6 | 1,500 | | 1.0 | 3.0 | 7 | 14 |

*10 seconds—10 minutes.

**TABLE 2—MUD MATERIALS USED ON THE 1-EE UNIVERSITY**

| Material used— | Unit size | Cost per lb. (dollars) | Total amount material used | Total cost (dollars) |
|---|---|---|---|---|
| Barite | 100-lb. sx | 0.0233 | 45,448 sx | $105,893.84 |
| Driscose | 50-lb. sx | 0.828 | 65,985 lb. | 54,635.58 |
| Diesel oil | 42-gal. bbl. | 6.72 bbl. | 5,684 bbl. | 38,196.48 |
| Bentonite | 100-lb. sx | 0.0226 | 6,788 sx | 15,340.88 |
| Quebracho | 50-lb. sx | 0.19 | 79,970 lb. | 15,194.30 |
| Caustic soda | 50-lb. sx | 0.0935 | 84,715 lb. | 7,920.85 |
| Graphite | 50-lb. sx | 0.16 | 40,300 lb. | 6,448.00 |
| Mica | 50-lb. sx | 0.074 | 1,635 sx | 6,049.50 |
| Fiber | 40-lb. sx | 0.092 | 1,572 sx | 5,784.96 |
| Ferrochrome lignosulfonate | 50-lb. sx | 0.21 | 16,575 lb. | 3,480.75 |
| Salt-water clay | 80-lb. sx | 0.0332 | 1,078 sx | 2,867.48 |
| Cellophane | 25-lb. sx | 0.258 | 263 sx | 1,696.35 |
| Walnut shells | 50-lb. sx | 0.18 | 152 sx | 1,368.00 |
| Lignite | 50-lb. sx | 0.10 | 6,125 lb. | 612.50 |
| Hulls | 100-lb. sx | 0.035 | 150 sx | 525.00 |
| Sodium bicarbonate | 100-lb. sx | 0.07 | 2,950 lb. | 206.50 |
| Lime | 50-lb. sx | 0.02 | 3,343 lb. | 66.86 |
| Barium carbonate | 50-lb. sx | 0.101 | 400 lb. | 40.40 |
| Soda ash | 100-lb. sx | 0.043 | 650 lb. | 27.95 |
| Total | | | | $266,356.18 |
| Mud cost per day (732 days) | | | | $363.87 |
| Mud cost per foot (25,340 ft.) | | | | $ 10.51 |

**TABLE 3—MUD MATERIALS USED ON 1-EE UNIVERSITY FROM 20,000 FT. TO TD**

| Material used— | Unit size | Cost per lb. (dollars) | Total amount material used | Total cost (dollars) | Per cent of total |
|---|---|---|---|---|---|
| Barite | 100-lb. sx | 0.0233 | 25,704 sx | 59,890.32 | 42 |
| Driscose | 50-lb. sx | 0.828 | 41,835 lb. | 34,639.79 | 25 |
| Diesel oil | 42-gal. bbl. | 6.72 bbl. | 2,370 bbl. | 15,926.40 | 11 |
| Quebracho | 50-lb. sx | 0.19 | 56,745 lb. | 10,781.55 | 8 |
| Caustic soda | 50-lb. sx | 0.0935 | 59,275 lb. | 5,542.25 | 4 |
| Bentonite | 100-lb. sx | 0.0226 | 2,373 sx | 5,362.98 | 4 |
| Graphite | 50-lb. sx | 0.16 | 31,800 lb. | 5,088.00 | 4 |
| Ferrochrome lignosulfonate | 50-lb. sx | 0.21 | 16,575 lb. | 3,480.75 | 2 |
| Lignite | 50-lb. sx | 0.10 | 3,775 lb. | 377.50 | .. |
| Mica | 50-lb. sx | 0.074 | 900 lb. | 66.60 | .. |
| Sodium bicarbonate | | 0.07 | 700 lb. | 49.00 | .. |
| Barium carbonate | 100-lb. sx | 0.101 | 400 lb. | 40.40 | .. |
| Lime | 50-lb. sx | 0.02 | 2,418 lb. | 49.00 | .. |
| Total cost | | | | $141,294.54 | |
| Mud cost per day (330 days) | | | | $428.17 | |
| Mud cost per foot (5,340 ft.) | | | | 26.46 | |

### The 1-EE University

The drilling mud used to drill the 1-EE University was unusual in that its simplicity of composition and maintenance was almost as remarkable as some of the other records that were made on the world's deepest well. In 1956 the mud started out as a Driscose low-solids oil-emulsion mud and 2 years later it was the very same type of mud. The same materials were being used and the daily treatment program was the same. (See Table 1.)

The mud was thinned with conventional tannin compounds. The basic thinner was a compound containing Australian tannin, quebracho, and lignite. Extra lignite was used at times and ferrochrome lignosulfonate was added near total depth. The water loss was controlled exclusively with Driscose. The viscosity was maintained with bentonite and Driscose. The mud usually contained about 8% diesel oil.

Pecos County formations are typical of West Texas where deep drilling is generally hard, slow, and fairly trouble-free. Mud properties at normal depths are generally not critical. The properties of this mud were about the same at 25,000 ft. as they were at 10,000 ft. At 25,000 ft. the mud had been in use for 2 years. At 25,000 ft., however, the mud had been subjected to recorded hole temperatures as high as 351° F.

It required 732 days to reach 25,340 ft. on the 1-EE University. At total depth $266,000 had been spent for drilling mud. The average mud cost was $363 per day, or $10.51 per foot. (See Table 2.) The hole was drilled at an average rate of 3 ft. per rotating hour.

**$141,000 in 330 days . . .** The length of time required to drill the last 5,340 ft. was 330 days. The mud used in this interval cost $141,000, an average of $428 per day. For each foot of hole drilled below 20,000 ft., $26.40 was spent for mud. (See Table 3.) This was not a special-purpose mud nor did it have unique characteristics. With small variations it is the mud used in most of the wells drilled by Phillips each year. It did, however, receive very close supervision both in the field and in the technical services laboratory at Bartlesville, particularly during the final stages of drilling the well.

It is now known that this type of mud can be used to drill a 25,000-ft. well. The special feature of this mud was that it delivered cuttings from the bottom of the well up through an annulus that was 4¾ miles long. Every 5 hours the mud circulated through formations that were almost hot enough to melt tinners' solder. The mud remained fluid even during long periods of quiescence.

During the 330 days it took to drill the last 5,340 ft. of hole, the bit was rotating and making hole 147 days, about 44% of the total time. Only 4½ days of the 330 days were charged to circulating and conditioning mud.

**Fishing causes delay . . .** Early in January 1958 a big fishing job occurred at 21,397 ft. A joint of 4½-in. drill pipe parted at the rig floor while the pipe was being picked up off the slips. A fish 17,786 ft. in length fell into the well. After screwing into the fish and pulling on it, the pipe again parted 104 ft. from the rotary. The fish was again caught and while applying a torque to it, the pipe twisted off at 1,484 ft.

After many failures to retrieve all of the fish, a cement plug was laid and a whipstock was set at 19,904 ft. Exactly 107 days after the pipe parted, the rig again had reached 21,397 ft. During the fishing job, which really was a composite of many small fishing jobs, the hole gave some trouble. Bridges appeared and the hole frequently required reaming. It usually took 12 hours to make a trip. There was very little time available for conditioning the hole and mud. The mud viscosity was increased during the fishing job to about 90 seconds funnel.

The sidetracked hole gave very little trouble except on two occasions when the pipe was stuck briefly. Diesel oil was spotted and in each case the pipe soon came free. The hole deviation below the whipstock ranged from 6° to 9°. An average of 100 lb. of graphite was put into the mud each day. There was some evidence of torque reduction so it was used as extra insurance against stuck drill pipe in the crooked hole. Subsequent tests on the mud showed that it satisfactorily passed lubricity tests on an extreme-pressure lubrication tester.

Small amounts of lime were used in the daily treatment of the mud to control the carbonates and to soften the makeup water. Eventually the lime appeared to be producing gels in the

**TABLE 4—PROPERTIES OF MUD SAMPLES TAKEN FROM VARIOUS DEPTHS AFTER SETTING FOR 31 DAYS—FIELD CHECK 1-EE UNIVERSITY**

| Time | Temp., °F. | Depth, ft. | Funnel vis. | Apparent vis. | Plastic vis. | Yield point | Density | Water loss | Filter cake | pH | Fann gels |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Started pumping at 2:35 a.m. | | | | | | | | | | | |
| Top fluid diesel and graphite | | | | | | | | | | | |
| Top sample | ... | | 46 | ... | ... | ... | 9.8 | ... | ... | ... | ... |
| 2:45 a.m. | ... | 1,000 | 43 | | | | 9.7 | | | | |
| 2:54 | ... | 2,000 | 46 | 28 | 19 | 18 | 10.0 | 8.0 | 2/32 | 12 | 4-8 |
| 3:10 | ... | 4,000 | 53 | ... | ... | ... | 10.4 | ... | ... | ... | ... |
| 3:22 | ... | 5,000 | 59 | 42 | 27 | 30 | 10.7 | 6.0 | 1/32 | 12 | 3-12 |
| 3:32 | ... | 6,000 | 61 | ... | ... | ... | 11.4 | ... | ... | ... | ... |
| 3:42 | ... | 7,000 | 62 | 50 | 34 | 32 | 11.7 | 5.6 | 1/32 | ... | 5-11 |
| 3:52 | ... | 8,000 | 64 | ... | ... | ... | 12.0 | ... | ... | ... | ... |
| 4:02 | 98 | 9,000 | 67 | 55 | 35 | 40 | 12.1 | 6.0 | 2/32 | ... | 7-14 |
| 4:12 | ... | 10,000 | 84 | (obstruction in funnel) | | | 11.9 | ... | ... | ... | ... |
| 4:19 | 100 | 11,000 | 61 | ... | ... | ... | 12.0 | ... | ... | ... | ... |
| 4:24 | 100 | 12,000 | 62 | 56 | 35 | 42 | 11.7 | 7.0 | 1/32 | 12 | 9-13 |
| 4:31 | 100 | 13,000 | 61 | ... | ... | ... | 11.3 | ... | ... | ... | ... |
| 4:38 | Gas cut | 14,000 | 65 | 48 | 30 | 36 | 10.4 | 10.0 | 2/32 | 12 | 10-14 |
| 4:45 | Gas cut | | | | | | | | | | |
| | 101 | 15,000 | 69 | ... | ... | ... | 9.5 | ... | ... | ... | ... |
| 4:52 | 100 | 16,000 | 72 | 45 | 29 | 32 | 9.7 | 14.8 | 3/32 | ... | 8 |
| 4:59 | ... | 17,000 | 67 | ... | ... | ... | 9.4 | ... | ... | ... | ... |
| 5:06 | 99 | 18,000 | 71 | 45 | 30 | 30 | 9.5 | 10.0 | 2/32 | 12 | 7 |
| 5:13 | ... | 19,000 | 68 | ... | ... | ... | 9.9 | ... | ... | ... | ... |
| 5:20 | ... | 20,000 | 69 | 50 | 32 | 36 | 10.4 | 9.6 | 1/32 | ... | 8-14 |
| 5:35 | ... | 20,000 | 63 | 55 | 36 | 38 | 11.8 | 6.4 | 1/32 | | 8-15 |
| 5:40 | 104 | 20,000 | 59 | 43 | 29 | 28 | 11.1 | 6.6 | 1/32 | 12 | 8-22 |
| 5:45 | 104 | 21,000 | 58 | ... | ... | ... | 11.2 | ... | ... | ... | ... |
| 5:50 | 102 | 22,000 | 58 | 42.5 | 29 | 27 | 10.8 | 7.8 | 1/32 | 12 | 10-20 |
| 5:55 | 102 | 22,915 | 61 | 44 | 28 | 32 | 11.0 | 11.2 | 2/32 | | 12-22 |
| Average properties | 101 | ..... | 62 | 46 | 30 | 32 | 10.8 | 8.4 | .... | 12 | 8-15 |

mud which is characteristic of a mud partially converted to lime base. Addition of lime was discontinued.

**Shut down 31 days . . .** In August the drill pipe was laid down and the rig was shut down to wait for a new string of high-strength drill pipe. For 31 days the mud in the well was not disturbed. Total depth at that time was 24,357 ft.

Immediately after all the new pipe was in the hole, circulated samples of mud were collected from calculated intervals of 1,000 ft. Duplicate samples were prepared and flown to Phillips' laboratories in Bartlesville where studies were made to determine if thermal and bacterial degradation had occurred. Checks made at the well site showed that these samples had a wide range of mud properties because each sample had a 31-day exposure to the environment of one spot in the well. All of the mud samples were affected to some extent. There was oil migration in the upper hole. There was minor stratified settling and considerable gas from other segments of the hole. These affected the mud weight and flow properties.

The gas entrained in the mud contained 24% carbon dioxide. This affected the pH of the mud. The water-loss variation resulted from gas in the mud, changes in solids content, and aging at the various temperatures that existed from 0 to 23,000 ft. Table 4 shows the properties of the mud samples from the various depths. The water losses are 7½-minute tests that have been doubled. The samples which were sent to Bartlesville were again checked in the technical services laboratory. (See Table 5.) The air and gas were removed in transit and the muds were agitated before testing. The muds looked considerably better this time. (Note the effect of aging

**TABLE 5—PROPERTIES OF MUD SAMPLES TAKEN FROM VARIOUS DEPTHS AFTER SETTING FOR 31 DAYS—LABORATORY CHECK 1-EE UNIVERSITY**

| Depth, ft. | Density | Apparent vis. | Plastic vis. | Yield point | Fann gels | pH | Water loss | Oil vol. % | Solids vol. % |
|---|---|---|---|---|---|---|---|---|---|
| 1,000 | 9.7 | 9.5 | 9 | 1 | 1-2 | 10.3 | 12.4 | 14 | 7 |
| 2,000 | 10.1 | 10 | 9 | 2 | 1-2 | 10.5 | 12.2 | 12 | 6 |
| 3,000 | 10.2 | 10 | 10 | 0 | 1-2 | 10.48 | 11.0 | 10 | 9 |
| 4,000 | 10.2 | 10 | 9 | 2 | 1-2 | 10.32 | 10.4 | 9 | 7 |
| 5,000 | 10.7 | 12 | 12 | 0 | 1-2 | 10.45 | 10.2 | 6 | 10 |
| 6,000 | 11.2 | 13 | 11 | 4 | 1-2 | 10.49 | 7.4 | 6 | 9 |
| 7,000 | 11.6 | 16 | 16 | 0 | 2-6 | 10.48 | 6.8 | 6 | 10 |
| 8,000 | 12.0 | 22 | 20 | 4 | 2-6 | 10.50 | 5.0 | 5 | 12 |
| 9,000 | 12.1 | 24 | 21 | 6 | 2-6 | 10.43 | 4.8 | 5 | 11 |
| 10,000 | 12.0 | 26.5 | 23 | 7 | 2-6 | 10.40 | 4.0 | 2 | 14 |
| 11,000 | 12.0 | 25 | 22 | 6 | 2-6 | 10.40 | 5.2 | 5 | 11 |
| 12,000 | 11.7 | 23 | 19 | 8 | 2-6 | 10.30 | 4.8 | 4 | 13 |
| 13,000 | 11.3 | 19 | 19 | 0 | 2-4 | 10.1 | 5.7 | 5 | 10 |
| 14,000 | 10.8 | 16 | 15 | 2 | 1-5 | 9.99 | 7.0 | 5 | 13 |
| 15,000 | 10.6 | 14.5 | 14 | 1 | 1-5 | 9.91 | 7.4 | 5 | 10 |
| 16,000 | 10.5 | 14.5 | 14 | 1 | 1-4 | 9.91 | 7.5 | 5 | 6 |
| 17,000 | 10.7 | 15.5 | 15 | 1 | 1-4 | 9.91 | 6.6 | 3 | 10 |
| 18,000 | 10.8 | 27 | 7 | 10 | 1-5 | 9.98 | 6.6 | 5 | 10 |
| 19,000 | 11.1 | 16.5 | 16 | 1 | 2-5 | 9.81 | 7.5 | 3 | 18 |
| 20,000 | 11.5 | 19 | 18 | 2 | 2-5 | 9.90 | 7.6 | 4 | 10 |
| 21,000 | 11.2 | 22.5 | 18 | 9 | 3-9 | 9.95 | 5.5 | 7 | 9 |
| 22,000 | 11.1 | 22 | 22 | 0 | 2-5 | 10.13 | 6.0 | 5 | 14 |
| 22,915 | 11.0 | 16 | 16 | 0 | 1-2 | 7.20 | 6.4 | 5 | 10 |
| Average properties | 11.0 | 17.5 | 15 | 3 | 2-4 | 10.08 | 7.3 | 6 | 10 |

**TABLE 6—EFFECT OF HIGH PRESSURE AND HIGH TEMPERATURE ON WATER LOSS OF TREATED MUD SAMPLE FROM 1-EE UNIVERSITY**

| Description— | Apparent vis. | Plastic vis. | Yield point | Fann gels | pH | API water loss | Water loss, 30 minutes 285° F. |
|---|---|---|---|---|---|---|---|
| Mud from 1-EE University, treated with 4 lb./bbl. Australian tannin, 1 lb./bbl. caustic soda, 1 lb./bbl. Driscose, aged overnight at room temperature before testing | 59 | 48 | 22 | 4-22 | 10.25 | 2.0 | 15.2 |
| Mud from 1-EE University, treated with same materials as above sample, but aged overnight in consistometer at 340° F. and 15,000 psi. | 45 | 34 | 22 | 4-13 | 9.4 | 2.6 | 15.2 |

for 31 days on the average mud properties.)

| | Funnel vis. | Weight | Water loss |
|---|---|---|---|
| Properties before laying down drill pipe | 54 | 11.6 | 6.0 |
| Average properties of all mud samples, well-site check | 62 | 10.8 | 8.4 |
| Average properties of all mud samples, Bartlesville laboratory | | 11.0 | 7.3 |

The mud properties were regarded as very good after the 31-day setting test. It was decided that this mud would be satisfactory to drill to any total depth in this well.

**No degradation . . .** There was no indication of bacterial degradation in the mud. Although one or two drilling-mud additives which have appeared on the market in recent years are capable of stimulating bacterial growth, other mud additives, particularly the thinners, are bactericides.

Thermal degradation in the mud was shown to be almost nonexistent by the condition of the mud after the 31 days of setting in the 1-EE University. This confirms laboratory evidence that indicates the hydrostatic pressures encountered in a well inhibit thermal degradation. (See Table 6.) This table shows that the water loss of a mud sample aged at 340° F. and 15,000 psi. was exactly the same as the water loss of the mud sample aged at room temperature. The water losses were taken at 285° F. on high-temperature testers.

**On to TD . . .** After drilling was resumed with the new drill pipe, it took 47 more days to drill 983 ft. to total depth of 25,340 ft. This part of the hole was drilled in 265 rotating hours or 11 drilling days. Few solids are introduced into a mud system from 983 ft. of 4¾-in. hole drilled in 47 days. During this period bentonite and Driscose were added for maintenance while makeup water was reduced because there were relatively few drilled solids entering the mud.

Tannin became less effective for rheology control. Pilot tests showed that mineral lignites or lignosulfonates would thin the mud better than quebracho. Eight pounds per barrel of ferrochrome lignosulfonate was added to the mud over a period of 2 days in two batches of 4 lb. per bbl. This treatment was made as a result of pilot testing in the Bartlesville laboratory. It was effective. The ferrochrome lignosulfonate, though a good thinner under conditions of high temperature, had a tendency to raise the water loss of the mud after it was aged at high temperature. Driscose was used to control the water loss satisfactorily.

**Closely supervised . . .** Control of the mud properties on this well was started at 5,500 ft. Mud-engineering service was furnished by the mud supplier until the well was at 11,500 ft. At this time Phillips mud engineers began servicing the well under the direction of the division supervisor located at Odessa.

In the middle of 1958, additional personnel were assigned to the area so that a company mud engineer could be on location 24 hours per day. As the well got deeper, mud samples were sent daily by mail car to Bartlesville where tests were made in the technical services division laboratory. The tests were usually high-temperature-aging and water-loss tests. General recommendations were then made by the Bartlesville office.

### The 1A Montgomery

The 1A Montgomery was spudded on July 11, 1957. It was drilled by Great Western Drilling Co.'s Rig 44 to a depth of 23,400 ft. in 383 days.

**TABLE 7—MUD PROPERTIES ON 1A MONTGOMERY**

| Depth, ft. | Density | Funnel vis. | Apparent vis. | Plastic vis. | Yield point | Gels Fann | Water loss | Cake | pH | Cl, p.p.m. | Total hardness | P Alk. | M Alk. | Lime P MVD | Lime lb./bbl. | Oil (%) | Solids (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,850 | 9.1 | 35 | 14 | 4 | 20 | 9-11 | | | 8 | 800 | 1,100 | 0 | 0.4 | | | | |
| 3,450 | 8.4 | 27 | 1.5 | 1 | 1 | 2-3 | 7.6 | 1/32 | 7 | 600 | | | | | | 3 | 1 |
| 4,000 | 8.4 | 28 | 2 | 1 | 2 | 3-4 | 26.8 | 1/32 | | 100 | 2,100 | 0.1 | 0.7 | | | 4½ | |
| 5,033 | 8.9 | 34 | 9 | 7 | 4 | 1-3 | 7.4 | 1/32 | 8 | 700 | 400 | | | | | | |
| 6,469 | 8.9 | 38 | 14 | 10 | 8 | 2-12 | 5.2 | 2/32 | 8 | 1,000 | | | | | | 8 | 3 |
| 7,020 | 8.7 | 36 | 10 | 8 | 4 | 1-2 | 6 | 1/32 | 12 | 165 | 200 | 1.1 | 1.9 | | | 7 | 4 |
| 8,125 | 9.2 | 36 | 12 | 10 | 4 | 0-7 | 7.6 | 1/32 | 7.8 | 900 | 600 | 0 | 0.4 | | | 7 | 5 |
| 9,260 | 9.4 | 39 | 12.5 | 10 | 5 | 1-12 | 8 | 1/32 | 7.6 | 900 | 600 | | | | | | |
| 10,140 | 9.7 | 46 | 20.5 | 17 | 7 | 1-13 | 6 | 1/32 | 8.5 | 700 | 200 | 0.15 | 0.5 | | | | |
| 11,030 | 10.4 | 41 | 18 | 15 | 6 | 1-17 | 7.2 | 1/32 | 10.5 | 1,200 | 400 | 0.5 | 1.6 | | | | |
| 12,263 | 10.5 | 36 | 15.5 | 12 | 7 | 1-27 | 6.8 | 1/32 | 10 | 2,000 | 300 | 0.45 | 2.15 | | | | |
| 13,150 | 10.4 | 47 | 20 | 15 | 10 | 2-26 | 5.6 | 1/32 | 10.5 | 3,000 | 600 | 0.5 | 2.5 | | | | |
| 14,220 | 10.6 | 40 | 17 | 14 | 6 | 1-19 | 5.2 | 1/32 | 10 | 2,000 | 250 | 0.5 | 1.7 | | | 7 | 11 |
| 15,807 | 10.4 | 80 | 37.5 | 23 | 22 | 4-21 | 4 | 1/32 | 10 | 1,500 | | 0.55 | 2.1 | | | 5 | 13 |
| 16,000 | 10.5 | 58 | 30.5 | 23 | 15 | 3-23 | 2.8 | 1/32 | 11 | 1,800 | | | | | | 6 | 9 |
| 17,035 | 9.5 | 42 | 19.5 | 13 | 3 | 1-2 | 8 | 1/64 | 10 | 1,000 | | 0.5 | 1.5 | | | 8 | 6 |
| 17,997 | 9.6 | 65 | 25.5 | 15 | 21 | 5-35 | 10 | 2/32 | 10 | | | 0.4 | 1.6 | | | | |
| 19,045 | 11.6 | 57 | 30.5 | 23 | 15 | 3-25 | 6.2 | 1/32 | 12.5 | 1,000 | | 1.8 | 5.0 | | 0.65 | 9 | 12 |
| 20,000 | 11.7 | 49 | 28 | 27 | 2 | 1-3 | 7.4 | 2/32 | 13 | 1,000 | | 2.8 | 6.0 | 10 | 2.0 | 6 | 14 |
| 21,015 | 11.8 | 59 | 45 | 35 | 20 | 2-12 | 6.4 | 2/32 | 13 | 1,500 | | 3.1 | 6.4 | 10 | 2.0 | 7 | 18 |
| 22,051 | 11.8 | 43 | 18 | 17 | 2 | 0-6 | 4.2 | 1/32 | 11.5 | 1,500 | 120 | 3 | 7 | 6 | 0.9 | 8 | 13 |
| 23,000 | 12 | 55 | 32 | 28 | 8 | 1-5 | 3.4 | 1/64 | 11 | 1,300 | 110 | 3.5 | 8 | 5 | | 9 | 14 |
| 23,400 | 10.4 | 51 | 34 | 28 | 12 | 1-5 | 7.6 | 1/32 | 11 | 900 | 300 | 1 | | | | 8 | 11 |

**TABLE 8—MUD MATERIALS USED ON THE 1A MONTGOMERY**

| Material used— | Unit size | Cost per lb. (dollars) | Total amount material used | Total cost (dollars) | Per cent of total |
|---|---|---|---|---|---|
| Barite | 100-lb. sx | 0.0233 | 43,975 sx | 102,463.13 | 44 |
| Driscose | 50-lb. sx | 0.828 | 49,299 lb. | 40,819.57 | 18 |
| Diesel oil | 42-gal. bbl. | 6.72 bbl. | 3,647 bbl. | 24,507.84 | 11 |
| Quebracho | 50-lb. sx | 0.19 | 84,516 lb. | 16,058.04 | 7 |
| Bentonite | 100-lb. sx | 0.0226 | 5,610 sx | 12,678.60 | 5 |
| Caustic soda | 50-lb. sx | 0.0935 | 97,500 lb. | 9,116.25 | 4 |
| Starch | 50-lb. sx | 0.149 | 36,500 lb. | 5,438.51 | 2 |
| Mica | 50-lb. sx | 0.074 | 1,251 sx | 4,628.70 | .. |
| Fiber | 40-lb. sx | 0.092 | 883 sx | 3,249.44 | .. |
| Lignite | 50-lb. sx | 0.10 | 29,150 lb. | 2,915.00 | .. |
| Lime | 50-lb. sx | 0.02 | 102,157 lb. | 2,043.14 | .. |
| Soda ash | 100-lb. sx | 0.043 | 32,800 lb. | 1,410.40 | .. |
| Kingseal | 50-lb. sx | 0.276 | 70 sx | 966.00 | .. |
| Barium carbonate | 50-lb. sx | 0.101 | 9,500 lb. | 959.50 | .. |
| Emulsifier | 55-gal. drm. | 3.59 gal. | 260 gal. | 933.40 | .. |
| Cottonseed hulls | 100-lb. sx | 0.0322 | 274 sx | 882.24 | .. |
| Mineral wool | 30-lb. sx | 0.12 | 192 sx | 706.56 | .. |
| Ferrochrome lignosulfonate | 50-lb. sx | 0.21 | 42 sx | 405.72 | .. |
| Lignox | 50-lb. sx | 0.17 | 29 sx | 246.79 | .. |
| Leather | 50-lb. sx | 0.175 | 15 sx | 131.10 | .. |
| Sodium bicarbonate | 50-lb. sx | 0.07 | 800 lb. | 56.00 | .. |
| Guar Flour | 100-lb. sx | ..... | 270 lb. | 113.40 | .. |
| Total cost | | | | 231,876.64 | |
| Mud cost per day (383 days) | | | | $605.39 | |
| Mud cost per foot (23,400 ft.) | | | | 9.91 | |

Average drilling rate to total depth was 5½ ft. per hour.

There was an abundance of drilling problems on this well. Circulation was lost nine times. There were nine fishing jobs. Gas pressure was a serious problem most of the time. The rig was able to reach the objective depth with very little loss of time. Forty-seven per cent of the total rig time was logged as drilling hours.

A low-solids oil-emulsion mud was used on the Montgomery. It varied from a milk-type oil emulsion with no fluid-loss control in the upper part of the hole to a Driscose emulsion with closely controlled properties. At 18,500 ft. the mud was converted to a lime system which was used to a depth of 22,000 ft. Table 7 gives mud properties.

The average mud cost was $602 per day, or $9.91 per foot. A total of $231,000 was spent for mud. The first 10,000 ft. of hole required only 10% of the total mud expenditure. The next 1,000 ft. of hole cost 13% of the total amount. (See Table 8.)

**Wolfcamp tests costly . . .** The Wolfcamp formation was first tested from 10,109 to 10,212 ft. Mud losses were severe and pressures required blowout procedures. The cost of testing the Wolfcamp was $31,167. Of this cost, $11,500 was for the 184 hours of rig time, most of which was used for mixing and conditioning mud. The rest of the cost was for mud materials.

Bottom-hole pressure in the Wolfcamp was 4,850 psi. A mud weighing 9.1 lb. per gal. would have produced a pressure equal to 4,850 psi. A mud weighing 10.1 lb. per gal. would have provided a 500-lb. excess. The mud weight was increased to 11.1 lb. per gal., but gas-cutting continued. Severe mud losses prevented raising the weight higher. The test was finally made with a mud that weighed 10.5 lb. per gal.

This experience with the Wolfcamp led to the conclusion that this formation will gas-cut the mud regardless of the mud weight. Recommendations were made that in the future a representative Wolfcamp formation be drilled into with a mud weighing not more than 10.2 lb. per gal. It was also recommended that safety equipment such as a drilling head, mud degasser, and pit-level indicator be used.

The world's longest string of 9⅝-in. casing was set in the 12¼-in. hole at 15,868 ft. The lower Wolfcamp was tested at 16,328 to 16,413 ft. The bottom-hole temperature at this time was 358° F. Gas-cutting continued to be a problem during the rest of the well. It was necessary to close the rams and circulate through the choke for a period of 15 minutes to 1½ hours on almost every trip.

**Hard-water headache . . .** A combination of mud problems occurred almost simultaneously after the intermediate string of 9⅝-in. casing had been set. The field makeup water was very hard. The total hardness was 2,900 p.p.m. as calcium carbonate. The mud was converted to calcium base by addition of lime.

Arrangements were made to purchase water from the city of Fort Stockton. It was delivered to the well for 22 cents per barrel.

Subsequent estimates showed that the cost of chemicals used in the mud was reduced about $200 per day. The daily lime additions were reduced and eventually discontinued. The effect of the fresh water in the system eventually improved the flow properties and gel strengths of the mud.

**Cyclone cools hot flow line . . .** About 3 weeks later a 3-in. cyclone separator was put into use on the rig to help remove drilled solids from the mud. In a period of 3 or 4 days the temperature of the mud at the flow line had dropped from 143° to 127° F. This was explained as resulting from a reduction in the frictional resistance created by undesirable mud solids. When the solids were removed, the temperature of this mud decreased.

The cyclone was used for 55 hours during a 16-day period. The mud was so completely rejuvenated that the cyclone was removed to another of the deep wells.

After reaching total depth, temperature surveys gave values of 472° and 435° F. The average bottom-hole temperature was taken as 453° F. This well may be the hottest known well in the world.

### The 1A Harral

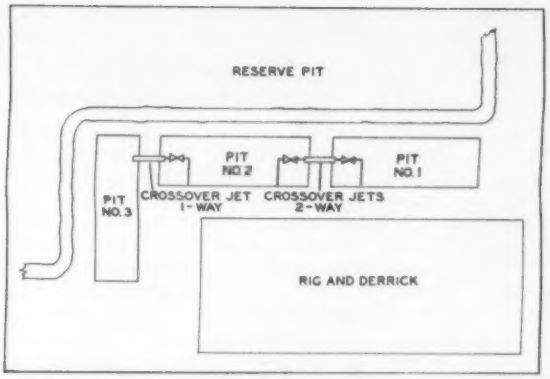
The third deep well in Pecos County was the 1A Harral. This well was the shallowest of the three Phillips wells. It was drilled to 19,020 ft. It was the most expensive and most troublesome. The total mud cost was $522,000 at the time it was completed. (See Table 9.)

The upper part of the hole was drilled with water and low-viscosity mud. Salt stringers were drilled between 2,300 and 2,700 ft. Washed-out hole made it necessary to raise the viscosity to obtain maximum cutting removal. A 9⅝-in. casing was set at 10,529 ft.

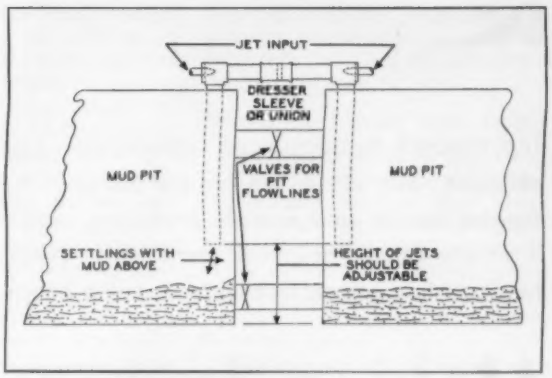
The well started kicking after a trip at 12,540 ft. The rams were closed, and the gas-cut mud was circulated through the choke. The mud weight was increased from 9.4 to 11.4 lb. per gal. At 12,500 ft. the Wolfcamp formation was tested. It was necessary to raise the mud weight to 13.1 lb. per gal. before taking the test. As in the Montgomery this test was time consuming and costly.

After testing the Wolfcamp, drilling continued. It was necessary to close the rams after trips while circulating gas heads that would build up during the trip. The mud weight at that time was 14.2 lb. per gal.

While making a trip at total depth of 14,589 ft. the well started flowing. With the bit at 6,000 ft. the well was killed with 1,000 bbl. of 17.5 and 19.3-lb. per gal. mud. In the process of getting the well under control the




**CROSSOVER JET SYSTEM** provided for jetting away tank settlings without removal of valuable mud. Fig. 1.




**TYPICAL CROSSOVER SYSTEM** uses three pits with one reversible crossover jet as shown here. Fig. 2.

hole bridged at 12,000 ft. For 3 weeks barite was poured into the well in amounts that are difficult to estimate. At times there were 500 sacks of barite per hour going into the mud at four different mixing points.

A 17.5-lb. mud was used to drill back to bottom. Chunks of formation which accumulated above the bit would frequently stick the drill pipe and obstruct circulation. A great deal of mud was lost to the formation. The gas caused the casing-protector rubbers to swell. These slipped up over the tool joints and created further problems of lost circulation. After getting the well back under control, drilling was resumed with the 17.5-lb. mud.

At 15,833 ft. the drill pipe was stuck 30 ft. from bottom while circulating off a gas head after a trip. Attempts to wash over and recover the fish failed. The fish was sidetracked. A permanent whipstock was set, and the hole was drilled around and below the fish. A 7⅝-in. casing was set at 15,819 ft. where it had stuck.

The casing made it possible to change out the 17.5-lb. mud with a lime-base mud weighing 10.5 lb. per gal. Gas continued to be a problem. The mud weight was 13.4 lb. per gal. when total depth was reached on June 26, 1958.

### Crossover Jets

Mechanical devices played an important part in keeping the muds in good condition. Degassers were necessary for gas removal. A cyclone-type separator was used on each of the wells to remove the formation solids.

One unheralded practice for keeping a mud system clean of formation solids is the practice of crossover jetting. Jetting good mud away is an accepted practice, because the pits, or tanks, fill up with settlings and room must be made for new water. It is difficult to estimate how much money is jetted away as good mud during the course of drilling a well.

This practice consists of an efficient system of crossover jets whereby the tank settlings can be removed without jetting away the valuable mud. The mechanics of removing the formation solids are fairly simple, but it is necessary to adhere to some specific procedure. For high efficiency there must be a surface-pit system large enough to prevent turbulence within the pits and a very efficient means of removing the settled solids without excessive loss of mud. It is necessary to use pits with jets to transfer the solids to the reserve pit. A system of crossover jets makes all of this possible.

A typical setup is one for three pits, Fig. 1, with one reversible crossover jet, Fig. 2, and one one-way crossover jet. If the number of pits is changed, it will be necessary to change the number of crossover jets. These crossover jets should be adjustable in height to compensate for the variations in level of settlings resulting from different penetration rates and different lengths of time between trips.

For the suction pit, a crossover jet is needed only to put mud into the pit. Mud can be removed from the suction pit by circulating through the fillup line and into the other pits. When each pit in turn is emptied of good mud, the pump is then switched to water, and the pit jets are used to remove solids from the pit. As soon as one pit is cleaned, then it can be refilled with good mud and the next pit may be cleaned. In this manner any and all pits can be cleaned with a minimum loss of mud. It is necessary that pit-connecting lines have a valve or baffle so as to be able to block it off for emptying and cleaning.

If Phillips avoided jetting away $50 worth of mud each day during the 1,500 drilling days on these three wells, then $75,000 worth of mud would have been retained in the systems that would have been lost if the crossover jets had not been in use.

**TABLE 9—MUD MATERIALS USED ON THE 1A HARRAL**

| Material used— | Unit size | Cost per lb. (dollars) | Total amount material used | Total cost (dollars) | Per cent of total cost |
|---|---|---|---|---|---|
| Barite | 100-lb. sx | 0.0233 | 170,184 sx | 396,528.72 | 81 |
| Driscose | 50-lb. sx | 0.828 | 37,805 lb. | 31,302.54 | 6.4 |
| Diesel oil | 42-gal. bbl. | 6.72 bbl. | 2,363 bbl. | 15,879.36 | 3.3 |
| Quebracho | 50-lb. sx | 0.19 | 78,210 lb. | 14,859.90 | 3 |
| Bentonite | 100-lb. sx | 0.0226 | 4,715 sx | 10,655.90 | 2.2 |
| Caustic soda | 50-lb. sx | 0.0935 | 73,315 lb. | 6,862.96 | 1.4 |
| Mica | 50-lb. sx | 0.074 | 791 sx | 2,926.70 | 0.6 |
| Salt | 100-lb. sx | 0.0118 | 1,285 sx | 1,509.88 | .... |
| Lime | 50-lb. sx | 0.02 | 53,372 lb. | 1,067.44 | .... |
| Leather | 50-lb. sx | 0.175 | 136 sx | 1,190.00 | .... |
| Lignite | 50-lb. sx | 0.10 | 10,250 lb. | 1,025.00 | .... |
| Emulsifier | 450-lb. drm. | 0.40 | 2,400 lb. | 960.00 | .... |
| Starch | 50-lb. sx | 0.149 | 4,400 lb. | 655.60 | .... |
| Soda ash | 100-lb. sx | 0.043 | 10,100 lb. | 434.31 | .... |
| Graphite | 50-lb. sx | 0.16 | 2,425 lb. | 388.00 | .... |
| Hulls | 100-lb. sx | 0.035 | 93 sx | 325.50 | .... |
| Fiber | 40-lb. sx | 0.092 | 83 sx | 305.44 | .... |
| Barium carbonate | 50-lb. sx | 0.101 | 1,600 lb. | 161.60 | .... |
| Sodium bicarbonate | 50-lb. sx | 0.07 | 1,200 lb. | 84.00 | .... |
| Total cost | | | | $487,122.85 | |
| Mud cost per day (364 days) | | | | $1,338.24 | |
| Mud cost per foot (19,020 ft.) | | | | 25.61 | |

PIPELINES

BY WARREN J. SEVERIN
Natural Gas Pipeline Co. of America

**The modern turbocharged compressor engine is efficient, but it's a noisome beast. Its roar creates health and morale problems, and makes it an unwelcome neighbor sometimes. Here's how two pipeline companies went about a program of**

# Making compressor stations quiet enough to live with

NOISE PROBLEMS connected with the transmission of natural gas have multiplied considerably in the past 10 years and the noise levels experienced have become quite severe. Recent court decisions favorable toward workers who suffer partial loss of hearing and the apparent loss of worker efficiency due to fatigue have also stimulated management to take a closer look at noise problems.

There are noise problems relating to blowoffs, meter and regulator lines, and other auxiliary equipment; however, this article will deal primarily with compressor-engine noise and ways of abating it.

### Texas Illinois Noise Problem

Our company's first real attempt at noise-control studies was conducted on the Texas Illinois system in 1953 and 1954, and they chose a dandy to start on. I was not connected with this type of work at that time, so the data I will present were recorded for the most part by a fellow employe, Seymour Lascoe.

A typical station consists of a main engine building, an auxiliary building, several warehouses, an office, and a cottage area having 16 to 18 houses. The main engine room houses six 10-cylinder 2-cycle engines, each rated at 2,000 b.hp. at 320 r.p.m.

The main engine room is a steel-frame building covered with corrugated-asbestos material. Large areas on the side and end walls are glass, and a 4-ft.-wide corrugated translucent strip runs around the side and end walls just under the eaves. The floor of the room is concrete. All of these materials have very poor sound-absorption qualities.

The noise levels at these locations were considerably higher than was ever anticipated. In addition, the scavenging pumps and intake-air system on the engines developed a low-frequency pressure pulse which caused the windows and doors of the office and cottages to rattle and shake.

The first steps taken were the installation of sheet-metal shields in front of the intake-air filters and the purchase of ear plugs to protect the operators' ears until a noise-abatement program could be developed. The shields reduced the troublesome low-frequency pulse at the office and cottage area, but did nothing toward reducing the noise level in the engine room; in fact, they no doubt increased the noise level in the engine room, since they reflected the sound energy leaving the air filters toward the building.

The original noise-level readings recorded at our Marshall, Tex., station showed that the over-all noise level anywhere in the building was 111 to 113 db. The noise level in the air-intake and exhaust-manifold area just outside the building was 125 db.

When you realize that normal conversation is carried on at a 60 to 70-db. level, that an outboard motor only develops 90 to 95 db., and that an auto trumpet horn puts out 110 to 115 db. sound-pressure level, you know that working in a 113-db. noise level is an unhealthful condition.

When you are also aware of the fact that temporary hearing impairment can result from exposure to prolonged noise levels in the region of 110 db. and that permanent damage of hearing can result from noise-pressure levels in excess of 115 db., then you know that these noise levels are not only unhealthful but dangerous.

An analysis of sound readings determined the over-all noise-pressure levels and which noise frequencies contributed the most energy to the noise levels; however, an evaluation of the noise energy from individually suspected sound sources was practically impossible due to the multitude of sound sources and reflected sound energy in the engine room, all of which affected the readings obtained.

It was reasoned, however, that the scavenging-air pumps, gears, power cylinders, and the exhaust system were the major noise sources on the engine. The plan of attack was to abate the major noise sources in the order of their suspected importance.

### Noise-Abatement Efforts

The first abatement work was attempted on the exhaust system. A sound-absorbing covering was designed for the water-cooled exhaust manifold and the exhaust pipe to the muffler. The cover consisted of a 3-in.-thick layer of glass-fiber pipe insulation covered by a jacket of 20-gage sheet aluminum.

After completing one of the six engines, little or no difference was noted in the noise level in the building; however, after completing all six engines, the noise level was reduced from 113 db. to 110 db., or a reduction of 3 db. This may not seem like a very large improvement, but when you remember that a 3-db. noise-pressure-level

Presented at University of Kansas Gas Compressor Institute, Liberal, Kans.

drop requires reducing the noise intensity by half its original value, it is actually quite an improvement.

The next major step in the program was a rather costly one, but it reduced the reflected sound energy in the engine room. It was noted during the time the insulation work on the exhaust manifold was in process, that just the presence of the sound-absorption material in the engine room reduced the apparent sound-pressure level in the building.

Subsequent tests indicated that the distribution of the sound-absorption material did not appear to alter its effectiveness. It could be piled on the floor or hung from the roof with approximately equal results. The final arrangement was the installation of a 3-in.-thick glass-fiber blanket between the roof purlins and wall girts.

The entire area of the roof and wall sections above the window level was covered with the material. This was then covered with perforated corrugated aluminum to improve the appearance of the engine room. After completing this work the over-all noise-pressure level of the engine room was reduced only 1 db. (from 110 to 109 db.); however, the noises now had directional qualities.

For the first time, operators could converse with one another if they yelled loud enough. Previously you could yell into a man's ear and he could not understand you. Operators could actually hear and locate engine noise. This is an important point, for most operational difficulties on an engine are detected by an operator's ears. At the original Texas Illinois station the operator could not detect engine troubles with his ears; in fact, he looked at the flywheel to determine if an engine was running or not.

Various other revisions were tested on the engines in an effort further to reduce the noise level in the engine rooms. Some were unsuccessful, but others proved very worth while and were adopted at all stations. Two of the revisions which proved unsuccessful may be of interest: (1) A ring was embedded in the gear rims. This appeared to reduce the ringing quality of the gear noise but did not appear to alter the noise level of the engine room. (2) The catwalks were shock-mounted on the engine but here again there was no noticeable improvement in the noise level.

### Successful Engine Revisions

Four revisions proved quite successful and were adopted at all stations:

1. The guards of the discharge feather valves on the scavenging pumps were slotted at the center to accommodate one long valve strip which would operate with a reverse curvature and thus not slap against the guard. A bakelite plate used over the seat was also tested and did reduce the noise but the single strip arrangement was considered satisfactory without the bakelite seat.

2. One of the three scavenging pumps on the engines was removed from operation. This was done primarily to improve fuel consumption; however, it also reduced the noise pressure level 1 db.

3. Truncated cones were inserted in the exhaust muffler stack. The length of the cones was half the wave length of the base exhaust pulse frequency and was slotted to reduce the back pressure it might develop and discourage pressure pulsation. Test data indicated a small improvement in the noise level both in the main engine room and on the plant site.

4. Truncated cones similar in design to those installed in the exhaust stacks were installed in the intake-air pipe between the air filter and the engine. These cones also reduced the noise level a small amount both inside and outside the building but, more important, they practically eliminated the low-frequency pulse experienced at the office and in the cottage area.

The final noise-level reading in these engine rooms, after all of the abatement work was completed, was approximately 106 db. This was a large improvement over the original 113 db., but the question is, "Is 106 db. low enough?" This is a difficult question to answer for there are a good many factors involved which determine what is acceptable.

One factor which most definitely enters the picture is the cost of abatement work. The cost of the abatement work on Texas Illinois was slightly over $15,000 per station, which is a sizable investment. If we find that a further reduction can be gained at a reasonable cost, additional noise-reduction work will no doubt be done in the future.

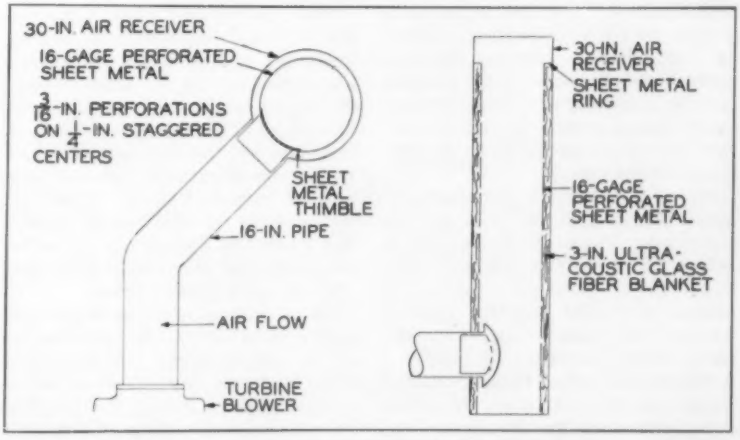
### Natural Gas Pipeline Noise Problem

The noise problem on the Natural Gas Pipeline system was a far simpler problem than the Texas Illinois problem; however, we think we gained knowledge which could prove very useful on the Texas Illinois system. The noise problem on Natural was confined to the air-intake system to the turbine blowers.

With the absence of other major noise sources, an excellent analysis of various noise-abatement work on the intake system could be made. Since the air intake to the Texas Illinois engines is still, and always has been, a major noise source, we feel that a revision to these engines, similar to the one installed on the Natural engines, will produce a substantial reduction in the noise level at these stations.

A typical main-line station now has 10 turbocharged 24 by 36-in. horizontal engines rated at 1,750 b.hp. at 125 r.p.m. We experimentally turbocharged two main-line engines in 1956 and completed the turbocharging program of all main-line engines in December 1957. The noise problem on Natural of course resulted from this turbocharging program.

I recall a remark an operator made while listening to the first experimental engine run. He said, "With 10 of those engines running, the Natural system will be as noisy as the Texas Illinois system." We hardly believed that, but we couldn't really predict the noise level 10 engines would generate, nor did we know what would be required to silence them! I think this is a condition which will be rectified in a few years. Now, we install something and then if it's too noisy, we re-




**NOISE CULPRIT** is air receiver from which turbine blower draws air. Fig. 1.

vise it. It would be much easier to include the required noise-abatement work in the design!

After completing the turbocharging program, it was obvious that a noise-control program was required. This was particularly true at the stations east of Beatrice, Neb. At these stations the intake and exhaust-manifold area of the engines was just across the fence from the cottage area and the resulting noise level in the cottage area was very objectionable, particularly in the summertime when the windows and doors of the cottages were normally open.

Conversation in the cottages was difficult and it certainly wasn't conducive to good sound sleep. It was also true at these particular stations that no intake-air filters were used and thus the blower of the turbine drew air from a home-made air receiver fabricated from a 10-ft. length of 30-in. pipe set on end. (The general piping plan is shown on Fig. 1.)

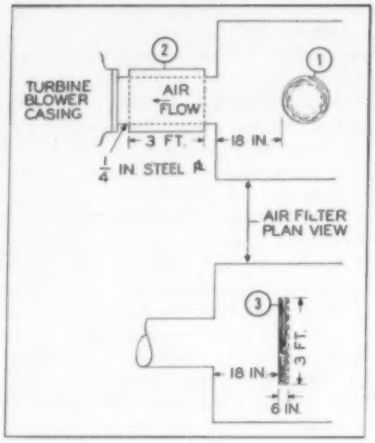
The majority of the noise energy was obviously coming from the intake-air receivers; however, the instruments were used to record the original sound-pressure levels for future reference. The instruments indicated a 97-db. noise level in the main engine room; the noise level in the intake and exhaust manifold area was 99 db. at ground level and 118 db. at the height of the air receivers; and the noise level in the cottage area was 80 db.

### Noise-Abatement Efforts

We first tried abating the noise energy emitting from the air receivers by installing cones in the air receivers. The cones tested were not truncated cones as used on the Texas Illinois system, but a short 45°-angle cone designed to reflect the sound energy back into the air receiver.

These cones did reduce the noise level at the top of the air receivers approximately 2 db. which is comparable to the improvement realized on Texas Illinois. However, an adequate improvement was not realized and the cones also produced an undesirable pressure drop as indicated by the loss of air pressure at the discharge of the blower.

A revision designed to absorb the sound energy in the air receiver was tested next. The revision consisted of lining the 30-in. air receiver with 3-in.-thick ultracoustic glass-fiber blanket (the same material used on the roof and walls of the Texas Illinoise engine room) and installing a perforated metal liner to hold the fiber blanket in place yet allow the sound energy to enter the absorption material.




**SILENCING DEVICES** tested on engines with air filters: (1) Vertical cylinder, 18-in. by 6-ft. perforated sheet metal, lined with 3-in. ultracoustic blanket; (2) silencer outer wall 24-in. pipe, inner wall 18-in. cylinder of perforated sheet metal, space filled with 3-in. ultracoustic blanket; (3) panel, two 3 by 5-ft. sheets of perforated sheet-metal space filled with two layers of 3-in. ultracoustic blanket. Fig. 2.

The perforated metal used had ⅞-in. diameter perforations on ¼-in. staggered centers. This offered a 61% open area yet prevented possible erosion of the fiber blanket during operation. Since the i.d. of the liner was 24 in. as compared to the 16-in. pipe used to deliver the air from the air receiver to the turbine blower, this installation did not produce any measurable pressure drop.

The noise reduction realized from this revision was far above our expectations. After completing one unit, the noise-level reading at the top of the air receiver was reduced from 118 db. to 112 db. However, we knew that the other eight engines that were operating and not yet revised were contributing a large part of the noise-level reading.

This was verified when it was determined that the noise-level reading at the top of the revised air receiver was approximately the same whether the engine was running or not. After revising all of the units at our Harper, Iowa, station, the noise-pressure level at the top of the air receivers was reduced from 118 db. to 92 db. At ground level the intake manifold area was 90 db. The cottage area was down to 60 db. and the predominate noise was obviously exhaust noise.

The final noise-level readings in the engine room was 92 db.; however, all of the improvement in the engine room could not be credited to the reduction realized outside the building. For between the time the original readings and the final readings were recorded the insulation on the exhaust pipes and elbows had been revised which no doubt contributed to the noise reduction. An engine room with a 92-db. noise level is a pretty quiet engine room. Operational difficulties on these engines are easily distinguished. In fact, you can actually hear when a cylinder approaches a 400-psi.-firing pressure. This, I think, is a major safety factor, particularly in an old horizontal station.

A very attractive feature of this revision is its relatively low cost. The material cost of this revision was approximately $70 per engine. The labor costs of the installation at a 10-unit station was approximately a 40-hour week for three laborers and a welder.

Some of you may question the wisdom of installing glass-fiber material in an air-intake pipe to an engine where it could possibly be pulled into the engine. We have now operated some of these units 10 months and there is no evidence of erosion of glass fiber. This material has a pretty good binder, and the small-diameter perforations plus the relatively low velocity of the air in the air receiver make it very unlikely that erosion will ever occur.

The noise-control programs for the stations south of Beatrice have not been completed. However, the experimental work has been completed and the revisions will no doubt be done as soon as pipeline operation permits. The recommended revisions at these stations are necessarily different since air filters are installed on these units.

Three silencing devices were tested on these units as shown on Fig. 2.

The silencing device marked No. 1 was the installation of a vertical cylinder inside the air filter. The cylinder was 18 in. in diameter and 6 ft. long and was made of perforated steel plate internally lined with the 3-in. thick ultracoustic glass-fiber blanket. This device reduced the noise-pressure level inside the air filter from the original 125 db. to 119 db.

The silencing device marked No. 2 was installed in the air pipe between the air filter and turbine-blower casing. This silencer was made by company personnel using perforated steel plate for the 18-in. inner wall and 24-in. o.d. pipe for the outer wall. The space between the inner and outer wall was of course filled with the 3-in. thick sound-absorption material.

This silencer reduces the noise level in the air filter from 125 db. to 111 db. If the length of the silencer could have been increased to 6 ft., I'm quite sure that the resulting improvement would have been considered more than satisfactory. However, the con-

nection between the air filter and turbine will only accommodate a silencer 3 ft. long.

The device marked No. 3 was the installation of an acoustic panel inside the air filter. The panel was made up of two 3 by 5-ft. sheets of perforated steel plate spaced apart by two 3-ft. thick layers of ultracoustic glass-fiber blanket. This device reduced the noise level inside the air filter from 125 db. to 116 db.

It has been recommended that silencing device No. 2 be installed on all units at one station and then if a further improvement is desired, device No. 3 or the acoustic panel be installed in all units. The tests showed that with both of these revisions installed, the noise level inside the air filter is reduced to 102 db. and that the noise level at a point 3 ft. in front of the air filter is reduced from the original reading of 114 db. to 93 db. This would most certainly be more than satisfactory.

I previously mentioned that we had hopes of further reducing the noise level on the Texas Illinois system. We plan to install an in-line silencer similar to device No. 2. The air piping to the Texas Illinois engines will accommodate a silencer 6 to 8 ft. in length which should very effectively reduce the noise energy leaving the air-intake system.

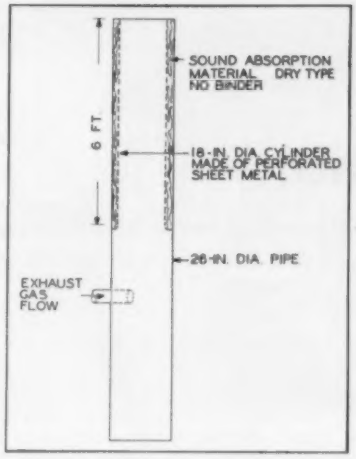
We realize that silencing an intake system of a pump-scavenged engine is considerably more difficult than a turbine blower. For one thing the low-frequency noise energy is much more predominate in a scavenging - pump system and the coefficient of absorption of most any acoustic material is lower at the low frequencies.

We also realize that the construction of the silencer must be much stronger to prevent fatigue failure of the perforated material due to the vibration that can accompany pulsating flow. However, we are confident a proper design is possible and that a very desirable noise reduction will be realized.

### Muffler-Noise Abatement

We have completed one other noise-leveling control study which may be of interest. The load rating of our vertical engines, used for generator service, was increased by tuning the intake and exhaust piping. The theory of the design is to develop rather high-amplitude pressure waves in the small-diameter tuned exhaust pipes and position a vacuum portion of the wave during the valve-overlap period of the cylinders and thus superscavenge the cylinders of exhaust gas.

In order to develop the most desirable scavenging pressure wave, the muffler must be a resistance-free system so as not to affect this pressure wave. The muffler we used was actually just a volume chamber formed by an 8-ft. length of 26-in. pipe with a 6-ft.-long 18-in.-diameter stack. Since it could not have any internal construction for silencing the exhaust blasts, the installation was rather noisy. The objectionable noise was heard at the office and cottage area and was obviously emitted from the stack.


SOUND ABSORPTION MATERIAL DRY TYPE NO BINDER
6 FT
18-IN. DIA CYLINDER MADE OF PERFORATED SHEET METAL
26-IN. DIA. PIPE
EXHAUST GAS FLOW

**EXPERIMENTAL EXHAUST MUFFLER** is for "hope" auxiliary engine. Fig. 3.

The revision tested on these mufflers, shown on Fig. 3, was very effective in reducing the objectionable noise. Actual noise-level readings have not been recorded as yet; however, the muffler noise no longer affects the conversation level in the office and cannot be heard in the cottage area.

As noted on Fig. 3, the sound-absorption material used on the exhaust system has no binder. The 3-in. thick sound-absorption material used on the intake system could not be used on the exhaust system for its binder burns out at 600° F. The dry material is good up to 1,000° F.

The dry material isn't objectionable, however, because it is supplied in blanket form and holds its shape fairly well. We haven't had much operational time on these installations as yet, but we don't anticipate serious deterioration or packing down of this material.

### Future Noise Abatement

Management in our industry is anxious to correct existing noise problems, and if at all possible eliminate noise problems in the design stage. The fact that SGA is now sponsoring a noise-control study at the Southwest Research Institute is evidence of its intent. The studies at the Southwest Research Institute embrace all of the serious noise sources relating to the gas industry.

I think we can also look for some help from equipment manufacturers. They are bidding from more and more specifications which designate an allowable noise level. This trend has no doubt stimulated their interest in noise-level control and has also caused them to reevaluate the consideration given noise when designing their equipment. This is a very good trend if the designated levels remain realistic, for there must be economic limits in their design.

## Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained October 1, 1956 (page 110), as well as the Indexes of Individual Items of Equipment that appear on the Costimating Page in the first issue of the months of January, April, July, and October.

Index (1946 = 100)

| | 1950 | 1954 | 1956 | 1957 | 1958 | Jan. 1959 |
|---|---|---|---|---|---|---|
| Pumps, compressors, etc. | 138.2 | 166.5 | 192.0 | 206.7 | 214.7 | 225.6 |
| Electrical machinery | 134.9 | 160.0 | 175.0 | 188.9 | 192.7 | 193.3 |
| Internal-combustion engines | 126.0 | 150.5 | 164.0 | 173.9 | 178.3 | 178.8 |
| Instruments | 127.8 | 154.6 | 182.1 | 187.4 | 194.9 | 204.1 |
| Heat exchangers | 140.0 | 171.7 | 190.7 | 203.6 | 181.2 | 175.8 |
| Miscellaneous equipment average | *126.2 | 160.7 | 180.5 | 192.1 | 192.4 | 195.5 |
| Materials component | 149.5 | 174.6 | 190.4 | 201.9 | 204.2 | 207.5 |
| Labor component | 144.0 | 183.3 | 198.2 | 208.6 | 220.4 | 226.2 |
| Nelson construction index | 146.2 | 179.8 | 195.3 | 205.9 | 213.9 | 218.7 |

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

The
FOREMAN'S PAGE

# Fire protection

**This article begins a series showing how practical fire-fighting methods are taught employes at one big refinery.**

A GREAT DEAL of time and many hundreds of thousands of dollars has been spent by Esso Standard Oil Co. in recent years to make their refineries safer places in which to work.

Many people throughout Esso's organization devote their full time to fire protection. Some of the groups are: the fire department, safety department, equipment inspection department, engineering departments (both process and mechanical) and the training department. They:

1. Design and procure up-to-date equipment for adequate fire protection of our unit.

2. Continually inspect operating equipment for safe operation.

3. Train people to operate this equipment.

The refinery does not depend on outside or city organizations to fight their fires or to provide any type of safety protection except in an extreme emergency. The equipment inside the refinery is "self-insured," that is, no insurance is carried with an outside insurance firm. Instead, the refinery has established the necessary organizations within the plant to protect the equipment.

In 1950, the general manager appointed a refinery fire committee. This committee was established as a result of several large losses sustained by the company due to fires. These losses amounted to about half a million dollars. The refinery fire committee was composed of members from the following departments: process, mechanical, engineering, safety, fire, and training. It was the function of the committee to review fire-fighting methods and general fire-protection system, and to develop a plan for a fire-fighting organization.

One of the first things done by the fire committee was to set up a routine inspection procedure of all fire-extinguishing equipment on process units and in buildings. This procedure has a definite purpose; to make all the personnel working in a department or unit familiar with the location of fire-fighting equipment and inspection procedure. It is important that you fulfill your responsibility in learning the location and proper use of fire-protection equipment at your units.

The committee also initiated a fire-training program and built a fire-training ground to train all employes in the use of fire-extinguishing equipment.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso Standard Oil Co.

### Why Study Fire Protection?

The study of fire protection has three basic objectives:

1. Overcome fear. Most everyone has a fear of a large refinery fire but a frightened person cannot act intelligently. He is likely to become panic-stricken and harm himself or others. For "fear," one should substitute "respect" for a large refinery fire.

2. Respect a fire. Foolhardiness is unwise and may complicate fire fighting. A wholesome respect for fire will develop fire-prevention thinking and lead to an aggressive—but safe—attack on fires if they occur.

3. Develop self-confidence. An increased knowledge of fire protection will increase one's ability to prevent fires and provide the background to attack them safely and effectively if they do develop.

### What Is Fire Protection?

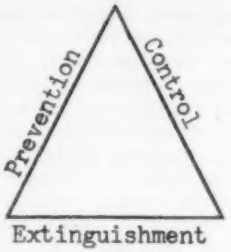
Fire protection is a science and can be divided into three parts:

1. Fire prevention is the engineering and training done to prevent fires. One of the principal objectives of training is to acquaint the employe with the causes of fires so they can be prevented more readily.

2. Fire control is the engineering and training done to minimize the spread or the damage resulting from fires. Some fires are better fought by letting the fuel burn out, meanwhile controlling its spread.

3. Fire extinguishment is the engineering and training done to insure that, if a fire is started, it will be brought under control safely, quickly, and effectively.

Here, then is a triangle to remember in this topic:

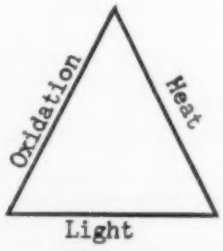



### What Is Fire?

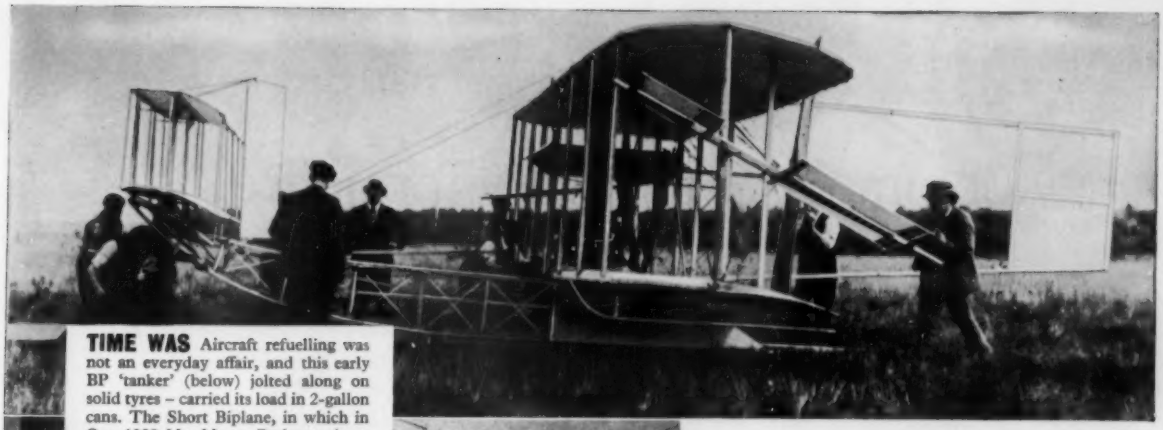
Fire is probably the best-known reaction in the world. It has been known for its usefulness since the day man discovered that by striking two rocks together he caused a spark that would ignite dry tinder. Yet, fire defies a simple definition. It is best defined in three parts:

1. Oxidation. There are many types of oxidation. The one probably most familiar is the rusting of iron, which in general is a slow process. The one we are interested in is the combination of oxygen (usually from the air) with some substance which is combustible.

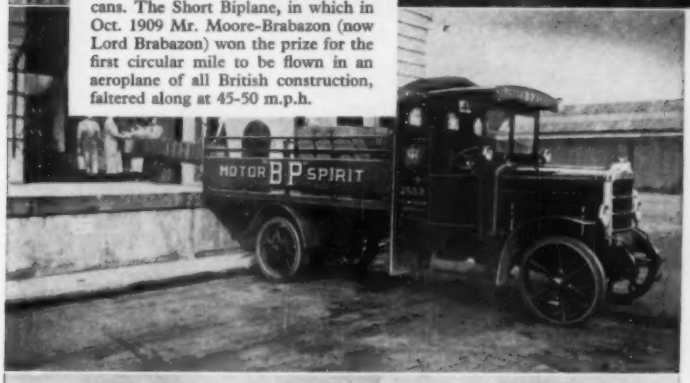
2. Heat. It isn't fire if heat isn't given off. In the rusting of an iron nail, minute quantities of heat are given off, as occurs when paint dries (but neither is fire because the oxidation reaction occurs too slow).




3. Light. It isn't fire if light isn't given off. When a fire is burning, oxidation takes place so rapidly and the temperature rises to such a degree that light is given off. The definition of fire may be stated as follows: Fire is rapid oxidation accompanied by heat and light.



**TIME WAS** Aircraft refuelling was not an everyday affair, and this early BP 'tanker' (below) jolted along on solid tyres – carried its load in 2-gallon cans. The Short Biplane, in which in Oct. 1909 Mr. Moore-Brabazon (now Lord Brabazon) won the prize for the first circular mile to be flown in an aeroplane of all British construction, faltered along at 45-50 m.p.h.



**TIME IS** The world has raced ahead in these fifty years. Now, the BP 'Cornwall' tanker (below) especially designed to fuel the Vickers Viscount is the maid-of-all-work in the Air BP Fleet. Together with the Viscount, it has set a standard for smooth, swift, reliable travel in the middle twentieth century.

# 50 UP

THIS YEAR THE BRITISH PETROLEUM COMPANY is exactly fifty years old. And what a fabulous, fascinating fifty years it's been.

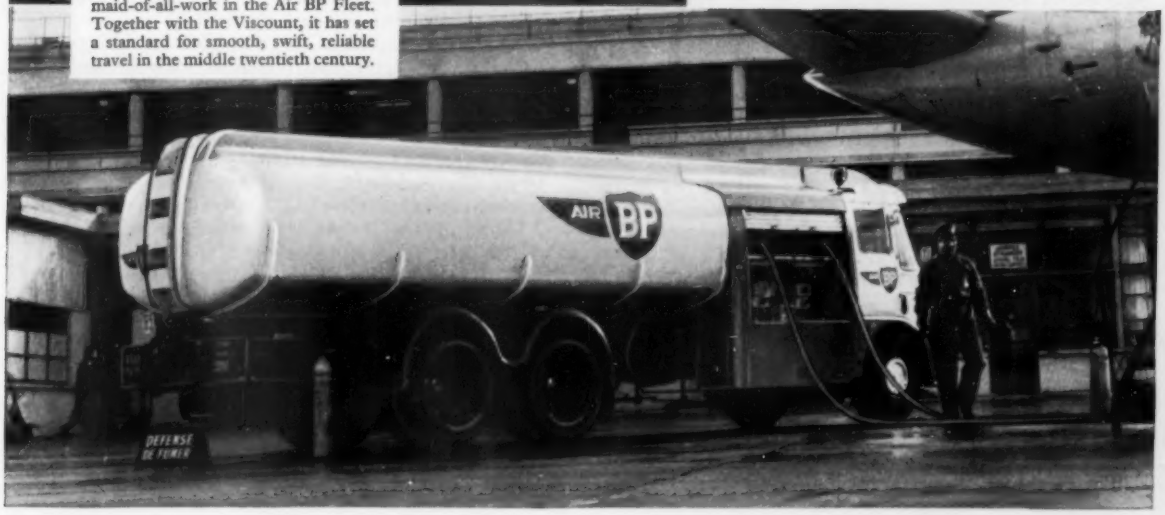
Look at the pictures. See how the world's raced ahead. Raced ahead – on oil. If all this has happened in just fifty years what will the next fifty years bring?

Today, the world spins on oiled wheels.

Tomorrow and tomorrow and tomorrow, who knows what progress will come?

But whatever happens, BP will be there, in front.

THE BRITISH PETROLEUM COMPANY



Creole Petroleum Corporation of Venezuela, one of the world's largest producers of crude oil, has pursued a dedicated course of conservation and maximum utilization of Venezuela's natural resources. In so doing, complex engineering problems in gas injection have been created.

An organization of the magnitude of Creole can readily command the very best engineering and construction talent available . . . and Brown & Root felt signally honored when in 1952 they were awarded a contract to design and construct a 60,000 horsepower gas injection station, to be located 7 miles from shore in Lake Maracaibo. The job was loaded with "firsts" and superlatives. For example, it was the first time centrifugal compressors were ever used to compress gas to 2000 p.s.i. This tremendous amount of horsepower was to be housed on a platform in 62 feet of water, with all the related problems of vibration, corrosion, noise and self-containment.

Evidence that the client was pleased with this $20 million project came when Brown & Root was awarded a contract to design and construct Conservation Plant Tía Juana Two of 84,000 horsepower, and then again Brown & Root was successful in obtaining the design and construction contracts for Tía Juana Plant Three of 98,000 horsepower. Conservation Plant Bachaquero One, Creole's fourth repressuring station, is currently on Brown & Root's drawing boards.

**BROWN & ROOT, INC.** *Engineers - Constructors*

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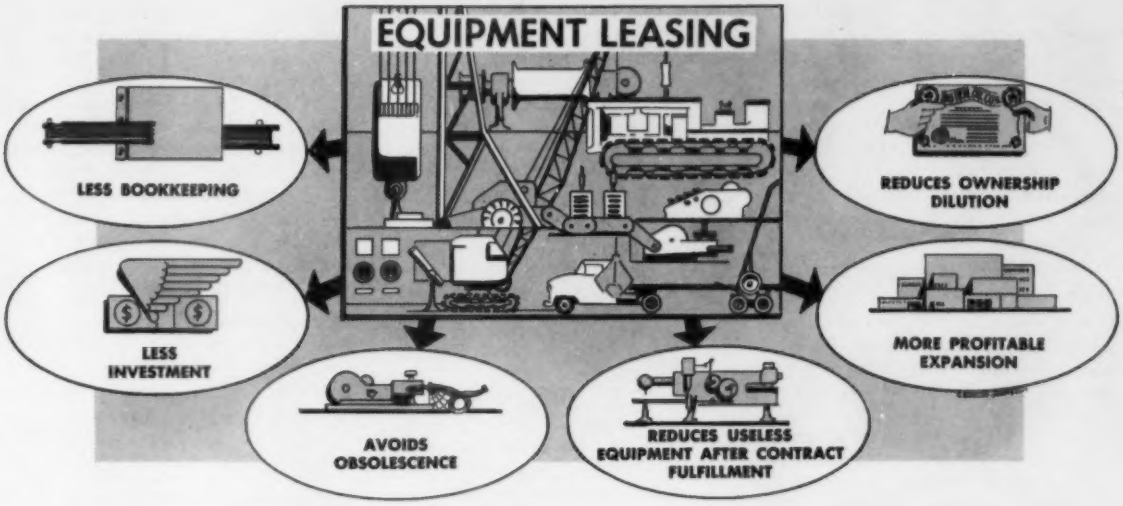
Brown & Root, LTDA., Santos, Sao Paulo, Brazil
CABLE ADDRESS – BROWNBILT




# Equipment leasing is on the rise

## Gain is 72% in year–to 19 million dollars in 1958

**Equipment leasing is a method of obtaining the use of income-producing equipment (fixed assets) without capital investment. When equipment is obtained in this way for use in production, the units remain the property of the leasing company, but are used by the lessee, who pays the leasing company a fixed charge for a stated period for using the equipment.**

BY ROBERT SHERIDAN
President, Nationwide Leasing Co.
Chicago

LEASING is a long-term arrangement, normally from 3 to 10 years, though in some cases it may be as little as 2 years or as long as 15 years. It is different from equipment rental, which is a short-term affair in which the rental firm rents out new or used pieces for a brief period, reclaims them at the end of the period, and then rents the equipment to other users.

**Oil-industry scope . . .** At the end of December 1958, there was approximately $19,000,000 worth of production equipment on long-term lease in the petroleum-refining industry. This represents a 12-month gain of $8,000,000, or 72%. Equipment leased ranged from special field installations costing $400,000 to office machines. This does not include cars, trucks, real estate, or buildings.

Major reasons for the growth of equipment leasing in the oil industry are the high cost of equipment, the importance of keeping maximum amount of working capital free to earn profits, the more rapid writeoff of equipment made possible by leasing, and the necessity of keeping bank lines open for short-term borrowing. Average before-tax profits on net working capital for the oil industry is a whopping 92%, which provides a powerful reason for keeping maximum cash liquid and working.

**No change in demand . . .** This method of obtaining the use of equipment does not lessen the demand picture for machinery and equipment. In fact, it may increase the use of equipment, because the oil company does not have to tie up large amounts of money in capital investment. Adoption of the lease method simply means that equipment purchase is done by the leasing company, not by the oil company.

**Rapid increase . . .** Basically, equipment leasing has increased as a result of the steadily increasing cost of capital equipment. Leasing has historically been a means of permitting businessmen to function without owning everything they need to do business, since profits are made by using capital equipment, rather than owning it. Specific reasons for the current growth of equipment leasing are:

1. Profit-producing equipment is put to work without capital investment. This is particularly important since working capital remains tight, despite the slight improvement resulting from inventory liquidation.
2. To increase profits without increasing a company's own capital investment.
3. To increase production without reducing liquidity of working capital.
4. To reduce the risk of loss caused by rapid obsolescence of specialized equipment.
5. To obtain equipment for limited-term use, either for special orders or for developmental or research work. This is particularly important where firms are involved in defense contract work.
6. For manufacturers of industrial equipment, leasing programs have proved to be an effective method of increasing sales.

**Other advantages . . .** Leasing improves a company's financial situation in these ways:

1. Leasing offers financing without dilution of ownership or control.
2. In leasing, there is no necessity

for a periodic cleanup of funds or a pledge of receivables.

3. Leasing may offer certain tax-timing advantages in specific instances.

4. Leasing makes for a cleaner balance sheet. Only the lease payments due within 12 months appear on the balance sheet, thus affecting the ratio of current assets to current debt very little. As a result, a company is able to use its established lines of credit for short-term borrowing without disturbance.

**How it works . . .** A company which wishes to lease equipment from a leasing company, submits an application describing itself—its business, its financial position, etc. It lists the specific manufacturer from whom it wishes to secure the equipment, the price of the equipment, the length of the lease terms it desires, and the form of payment it desires.

The leasing company then purchases the equipment and arranges for its shipment directly to the lessee's plant or store. Upon acceptance of the equipment, payments start. All equipment, no matter how many items are involved, can be covered by a single master lease and can be paid for in a single monthly payment. This is true regardless of how many suppliers are involved. This reduces the user's bookkeeping considerably.

**Types of equipment . . .** All types of equipment are leased. In 1958, equipment leased ranged in cost from a $17 hand truck to $5,000,000 worth of construction equipment. Both standard and specially built units can be leased.

**Length of lease . . .** Terms range generally from 3 to 10 years, or longer, although in some cases, where smaller sums are involved, they can be as little as 2 years. The user determines the length of lease he prefers, arranges the payments to suit his own needs. Leases are usually written on a uniform payment basis although they can be written on straight line, declining balance, sum of the digits, or any schedule preferred by the user.

**Financing comparison . . .** Leasing offers 100% financing and provides the oil producer with greater cash flow than any other financing method. As a result, the relative cost of leasing is less than other methods. Any expenditure of money to acquire equipment involves paying something for the use of the money.

Even in the case of outright cash purchase, the oil company is sacrificing the earnings that its working cash would yield; this, in effect, is what it is "paying" for the use of its own money. In the oil industry this means a "cost" of 92%—the average before-tax rate of profit on net working capital earned by oil companies.

Leasing frees more working capital immediately than does any other method of obtaining equipment, this capital can then be used for increased production and exploration, for example. The cash excess earns profits for the company at its normal rate for the life of the lease.

Over the term of the lease the additional profits produced by this cash excess (at a rate of 92%) will be so great that the relative cost of leasing will be lower than other financing methods.

**When advantageous . . .** These operating situations make leasing most advantageous:

1. In general, where companies can expand their operations profitably, if additional equipment and machinery were made available at smaller annual expense than through use of their own capital.

2. Companies which find themselves short of working capital but which have sufficient equipment, can remedy the situation through sale-leaseback transactions.

3. Companies faced with competition that is using the latest equipment, while they themselves lag on cost-saving. In this situation, acquiring the new equipment is essential, but often a large initial cost is prohibitive. In this situation, leasing can often provide the solution.

4. Companies which hold a tight check rein on capital expenditures and financial ratios. Leasing permits the management of these companies to secure new equipment without forcing the board of directors to raise more capital.

5. Where rapid obsolescence is a strong possibility, leasing bypasses the problem of capital investment in such equipment.

6. For pilot plants, developmental, or experimental projects, leasing offers a means of opening new areas of production without draining working capital on such unproved ventures.

7. Companies engaged in defense contract work are often enabled, through leasing, to obtain needed equipment for the term of the contract. In this way capital is not frozen in equipment which may not be useful after the contract has been fulfilled.

**Purchase options . . .** Leasing agreements can contain purchase options. However, a purchase option generally converts a leasing agreement into a conditional sales contract, in the eyes of the Internal Revenue Service. There are some exceptions to this general rule, but these exceptions are uncertain and depend on specific rulings by the Internal Revenue Service at the conclusion of the contract, many years later.

For this reason, purchase options are not recommended. True lease payments, as differentiated from disguised conditional sales - contract payments, are legitimate deductions as operating expenses. Conditional sales contracts are deductible only at the rate specified in the federal Government's depreciation schedules.

**Renewal options . . .** In leasing, the cost of the equipment is paid for entirely in the original leasing term. Renewal options are usually available at extremely low cost. They can range in length from 1-year options to indefinite terms.

**Tax advantages . . .** This has been an area of much misinformation. Leasing is not a method of tax avoidance; its primary value lies in the way it frees working capital for other uses. In certain specific situations leasing may also offer companies advantages of tax-timing which is not to be ignored. Leasing charges are legitimately deductible as business expenses. As such, they reduce taxable income now.

Leasing may also offer a tax advantage that can be of particular importance to companies which find that their equipment tends to become obsolete much more quickly than government depreciation tables permit.

For example, a company using equipment that experience shows it can expect to have to replace in 7 years, may find that depreciation tables permit depreciation only over 15 years. By leasing this equipment for a 7-year period, this company would be able to deduct the full cost of the equipment from taxable income in 7 years.

If the company had purchased the equipment, it would only have used 7 years worth of depreciation and would have to forego further depreciation benefits, if it wished to replace the equipment at the end of 7 years.

In certain sale-leaseback situations also, tax advantages may accrue, since the sale of an asset normally involves taxation at the capital-gains rate, if a profit is made, rather than at the corporate rate.

**Lease or buy . . .** There is no method of financing that fits every situation equally. Factors to be judged include the availability of working capital, the rate of profit the company earns on its working capital, the effect of leasing on the company's cash flow as compared with other financing methods, the company's competitive situation, and whether there are any tax advantages in the company's special situation.

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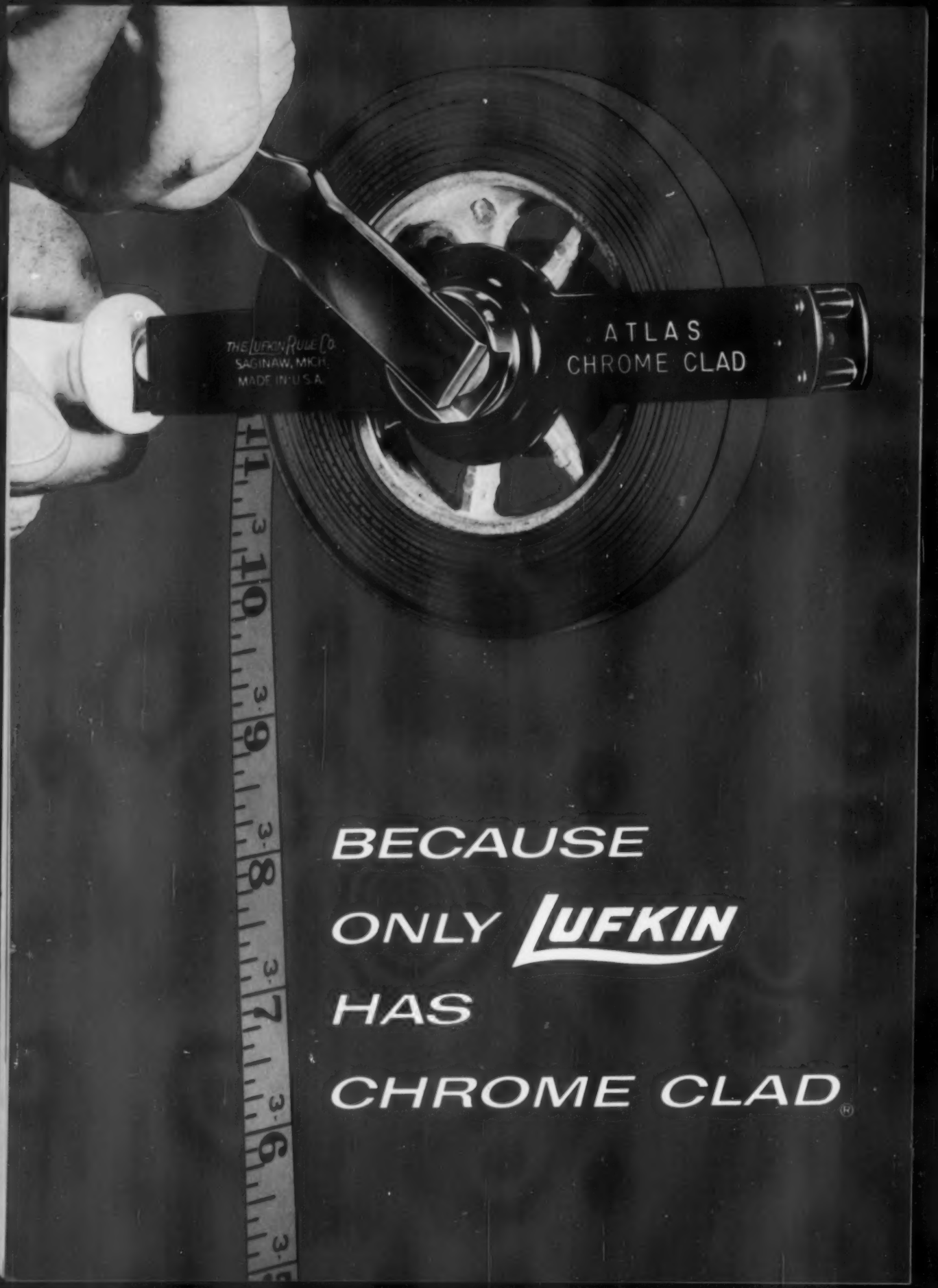
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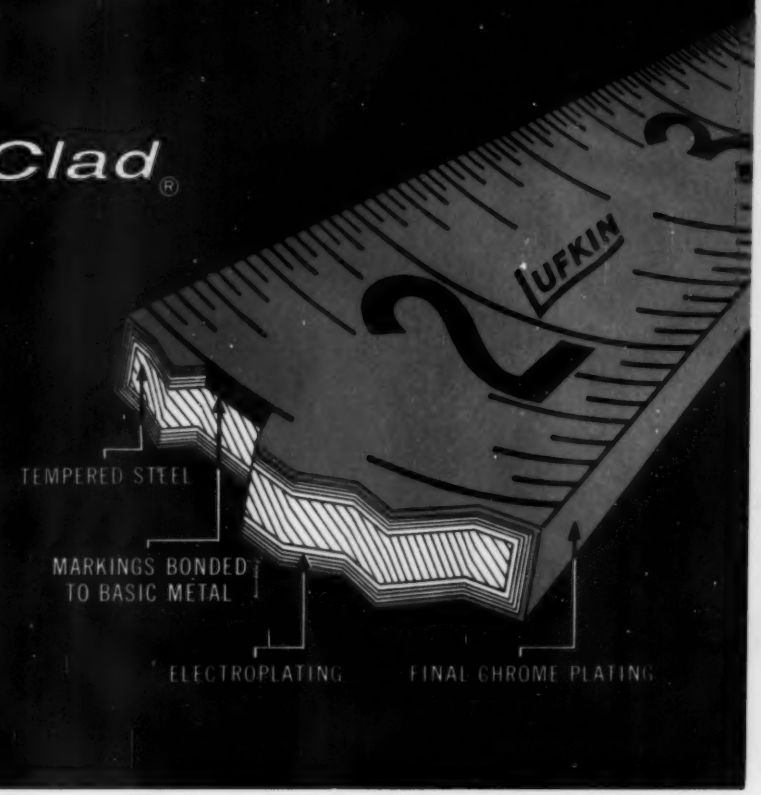


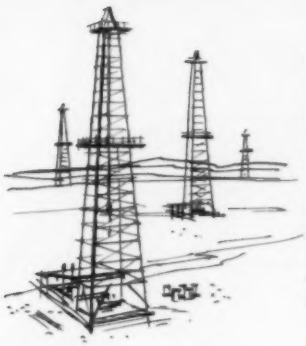

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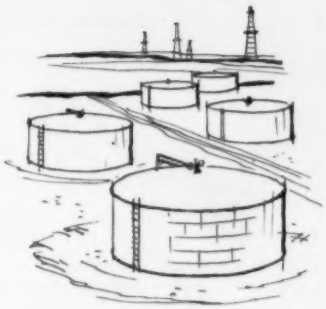
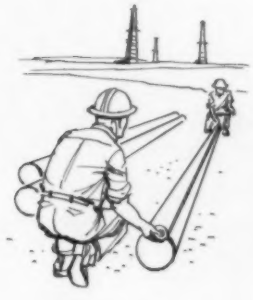


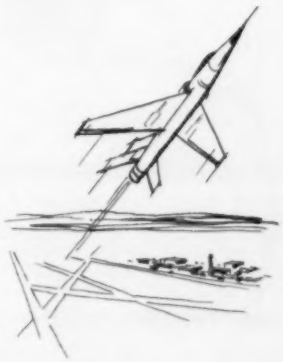
**ATLAS GAGING TAPE**

Heavy-duty tape for tank gaging. Chrome Clad finish shows oil level clearly, wipes clean easily. The ATLAS line is 50% heavier than standard . . . can be locked at any point for accurate sounding. Lengths from 18 to 100 ft.



**ANCHOR TAPE**

General-purpose Chrome Clad® tape in beautiful, hand-stitched leather case. Use it for measuring pipe, layout work, and most of the other "middle-distance" measurements. Lengths from 25 to 100 ft.



**JET GAGING TAPE**

A tank-gaging tape that reduces the danger of sparking when measuring jet fuels. Stainless-steel line with Chrome Clad finish. Wood handle. All other parts are of spark-resistant metal. Lengths from 33 to 75 ft.

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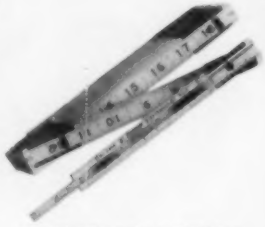

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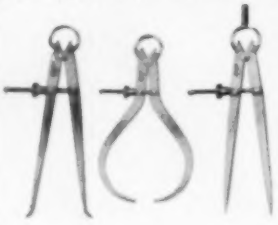

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# BOOKS

PROCEEDINGS OF THE ELEVENTH OIL RECOVERY CONFERENCE. "A CENTURY OF TEXAS OIL, 1875-1975." Published by the Texas Petroleum Research Committee, University of Texas, Austin. 262 pp. $1.

The book is a paper-bound volume containing 22 addresses and technical papers, which provide a comprehensive and authoritative review of the oil industry of Texas and its accomplishments during the past 75 years, and a forecast into all phases of the industry for the next quarter of a century. Addresses by Gov. Price Daniel of Texas, the Land Commissioner of Texas and the administrative heads of the Agricultural and Mechanical College of Texas and University of Texas, add interest to the book. The greater portion of the volume is devoted to technical papers by a galaxy of experts covering every phase of the industry, including an authoritative historical review, an economic forecast, improved methods of valuation, a frank discussion of technical and engineering education, reports on new and improved methods of increasing oil recovery, and even some information on the possible and probable use of electronic and nuclear energy in the production of oil. The tremendously important mechanical side of the art of producing oil is discussed ably and frankly and the probable trend in mechanical developments is forecast. The volume is replete with illustrations, charts, graphs, tabulations of data and the like.

AUTOMATION AND MANAGEMENT. By James R. Bright, Published by Division of Research, Harvard Business School, Soldiers Field, Boston 63. $10. 280 pp.

Does automation, as reflected in the highly automatic manufacturing system, create new and different problems for management? This is the basic question to which this study is directed.

The book is divided into three parts, the first section provides a background of the nature of production-line mechanization and the growth of automaticity in manufacturing.

The second part describes briefly the automation programs of 13 plants with respect to such areas as the benefits and liabilities that were assumed to result at these automated plants; and the conception, design, procurement, installation, and debugging experiences in these 13 installations.

The third part is directed toward such sensitive topics as the impact of automation on maintenance, on the skill requirements of the work force in the highly automated plant, on the sales effort, and, finally, on management itself.

The final chapter sums up 10 significant trends of current automation and their effects on the factory.

DYNAMIC DECADE, by Eric J. Hanson. Published by Dodd Mead & Co., Inc., 432 Fourth Avenue, New York 16, in the U. S., and McClelland & Stewart Ltd., 25 Hollinger Road, Toronto 16, Canada. 314 pp., $6.

In the 10 years since the discovery of oil at Leduc, Alberta, in 1947, exciting and dramatic changes have taken place not only in the province but in the whole of the Canadian economy. Dr. Hanson tells the amazing story of the great oil discoveries and their far-reaching consequences for Alberta and for Canada. He describes how the oil companies, large and small, have all had their share in the exploration and development work. He also recounts the progress

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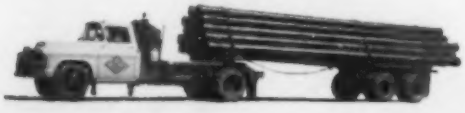

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of earlier exploration for oil in Alberta—in the tar sands of the Athabasca, in Turner Valley, and Langevin gas field near Medicine Hat. He gives the history of the oil companies which have contributed to development, and shows how Canada is gradually achieving a "fully integrated" oil industry. He also discusses the problems created by the new wealth—from the establishment of new refineries and townsites to the construction of pipelines and the constant search for new markets.

THE ROLE OF MIDDLE-MAN TRANSACTIONS IN WORLD TRADE. By Robert M. Lichtenberg. Published by National Bureau of Economic Research, 261 Madison Ave. 86 pp. $1.50.

What import and export figures show about the trade ties among the world's nations is often very different from what these ties actually are, according to this new report.

One major factor creating these differences is the middle-man trader, who buys goods in one country for resale to another. The study, by Robert M. Lichtenberg, identifies the role of the middle man in international trade for the first time and shows the countries in which middle-man traders are important in the flow of commodities across national borders.

The report is part of a larger study of the structure of world trade and payments undertaken by the National Bureau of Economic Research with the aid of a grant from the Ford Foundation.

Activities of multinational producers are an important part of the totals for the two chief middle-man trading countries. For example, U. S. and British companies operate production facilities in petroleum-producing countries and sell the output on world markets. Lichtenberg estimates that about 60% of the exports of the petroleum-producing countries were sold by middle-man traders in 1952.

OIL AND GAS IN THE FOUR CORNERS. Compiled and edited by Paul J. Kuhn. Published by National Petroleum Bibliography, Box 3586, Amarillo, Tex. 298 pp. $25.

Here is an excellent review of the oil and gas fields, regional geology, and production practices in Four Corners where a very intensive exploration and development campaign is now under way. This collection of papers is particularly timely in view of the current interest in Colorado, Utah, Arizona, and New Mexico.

There is a summary of the Four Corners geology covering stratigraphy and structures and the oil possibilities of northern Arizona are discussed in detail. The summaries of the principal producing oil and gas fields include electric logs of the producing zones and in many instances, detailed structural maps.

INTRODUCTION TO CHEMICAL ENGINEERING THERMODYNAMICS. Second edition. By J. M. Smith and H. C. Van Ness, McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. 490 pp. $8.75.

This book, which has been in use as a classroom text on thermodynamics for engineering students, has been extensively revised in this second edition. The authors provide a rigorous treatment of the subject, yet one which is not too difficult to understand. This book can be used in a one or two-semester course in the junior or senior year of the chemical engineering course. The first five chapters may also serve as an introduction to energy balances and P-V-T relations in the sophomore year.

This revised edition was made in recognition of the growing emphasis on science engineering. There is more extensive treatment of the thermodynamic properties of solutions and basic principles of fluid dynamics. More graphical data on fluid properties, more illustrative examples and more generalized charts are included.

SCIENTIFIC MANAGEMENT OF MARKETING OPERATIONS. By A. N. Seares. Society for Advancement of Management, 74 Fifth Ave., New York 11. $1.50. 35 pp.

How to combine modern marketing with profitable scientific management is the theme of this booklet. Some of the topics covered are: (1) how marketing activities are organized, (2) planning the marketing program, (3) development of corporate marketing strategy, (4) developing essential marketing intelligence, (5) technique for sales forecasting, and (6) setting up a sales-analysis system and training programs.

THE INDUSTRIAL COOLING TOWER. By K. K. McKelvey and M. Brooke. Published by Elsevier Publishing Co. Distributed in U. S. by D. Van Nostrand Co., 257 Fourth Ave., New York. 429 pp.

Noting that cooling-tower literature is widely scattered, the authors have brought together a volume dealing with: (1) basic principles of psychrometry, the psychrometric chart and weather data, (2) types of cooling tower and operating terms, (3) heat transfer in cooling towers, (4) performance—how to assess performance and the factors involved, (5) cost factors, (6) practical engineering calculations, (7) cooling-water treatment, and (8) auxiliary equipment, economics, and selection.

IMPROVING OIL RECOVERY. Published by Producers Publishing Co., Box 141, Bradford, Pa. $2.50. 226 pages.

This book consists of 16 lectures on oil recovery, given at the Department of Petroleum Engineering, University of Texas, by experts in the field of oil recovery.

Covering all phases of the field, the lectures range from "History and Significance of Fluid Injection Operations in the United States," by Paul D. Torrey, to "Significance of Secondary Recovery in the Penn Grade Area," by Robert B. Bossler.

Five of the lectures are by Torrey, one by Bossler, two by Claude R. Hocott, as well as lectures by W. L. Horner, Harold Vance, Arthur E. Barbeck, E. L. Downing, S. P. Ellison, Jr., James A. Lewis, Rupert C. Craze, and Albert E. Sweeney, Jr.

Among the subjects covered in the lectures are: financing oil production, economics and prediction of oil recovery by secondary methods and fluid-injection operations, development of unit and cooperative projects, origin of porosity and permeability, interpretation of core analysis in predicting oil recovery, mechanics of fluid injection by gas and water, problems of oil recovery from Carbonate reservoirs.

Other subjects covered include: development and operation of fluid-injection projects, significance of secondary recovery and pressure maintenance in the Mid-Continent and southwestern areas, new techniques for improving oil recovery and Railroad Commission of Texas, pertaining to fluid-injection operations.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

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# engine power

BY CATERPILLAR

## In oil field work, lugging ability is extra important and Cat Diesels have the torque rise to give it to you!

Every oil man knows the importance of engine power that can handle sudden heavy loads efficiently and without stalling out. The torque rise built into Caterpillar Diesels can deal with any ordinary power challenge. High torque capacity pays for itself when pulling pipe. Cat Engines respond by developing more *turning* force for steady power application as engine speeds drop.

In Cat power plants, torque rise characteristics are an important part of engine design. Torque rise for best lugging ability is a function of engine breathing. It depends on fuel injection and metering, too. In addition, Cat power packages provide an exclusive torque spring for greater efficiency. This device makes it possible to provide maximum engine torque at any *predetermined* engine speed. By using springs with varying tensions, you can change the RPM at which maximum torque will occur, and custom-fit your Cat Engine to any specific application!

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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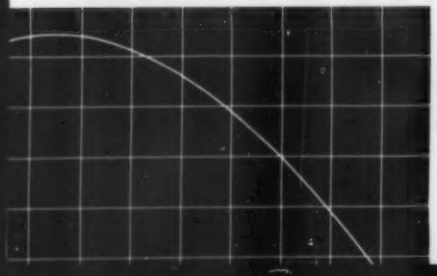
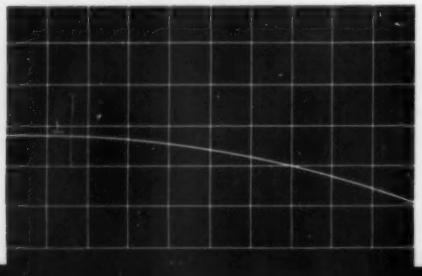
**What is lugging ability or torque rise?** When the throttle of an engine with no load is wide open, the engine runs at high idle. As load increases, the engine slows, *providing the torque—or turning force—necessary to match the load.* An engine operates at "lug" when load requirements momentarily demand more torque than that available at rated speed. Good lugging ability is represented by rapidly-increasing torque characteristics over a wide speed range as RPM drops.

Cat's exclusive torque spring provides *additional* fuel delivery to the cylinders under lug conditions—materially increasing engine torque at reduced engine speed.

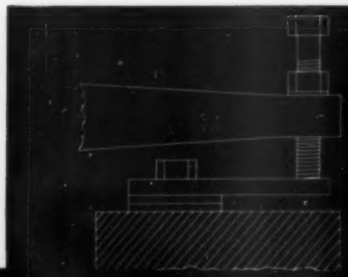
***Cat Engines have high torque rise*** **as indicated here. Horizontal lines show torque measured in lb.-ft. Vertical lines indicate engine RPM.**



***Most competitive engines*** **have comparatively less torque rise, which means inadequate lugging ability. This can be costly on the job.**



***Torque spring.*** **This is the Cat exclusive which permits you to select the engine speed at which you desire your maximum engine torque.**



# Which—air or water for cooling . . .

## *in condensation of overhead vapor?*

THE QUESTION often asked today concerning condensation of overhead vapors in fractionating equipment, is: "What cooling medium should be used —water or air?"

In the past this question came up only on special installations. Today obtaining ample water supplies has become a prime problem. The air-cooled exchanger has been the answer to this and other problems in a number of plants. It is not, however, a cure-all. The over-all economics may not point to the air-cooled exchanger as being the best choice, even where cooling water is expensive.

This is a condensation of paper by Bob G. Perkins of Celanese Corp. of America, Pampa, Tex. The paper was presented at annual meeting of AIChE at Cincinnati.

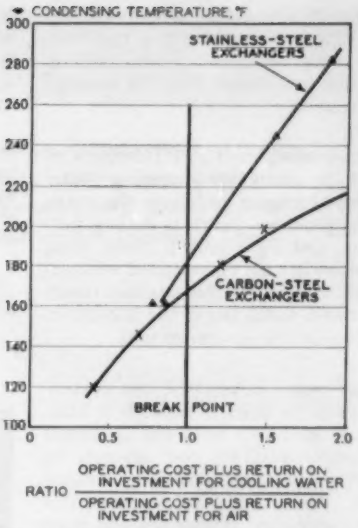
### Important Factors

There are several major factors in selecting the right cooling medium.

**TABLE 1—EVALUATION OF AIR VERSUS WATER AS COOLING MEDIUM FOR CONDENSING METHANOL AT 15 PSIG.**

| | | |
|---|---|---|
| Quantity, lb. per hour | 25,000 | |
| Heat load, B.t.u. per hour | 11,350,000 | |
| Condensing temperature, °F. | 180 | |
| | Air | Water |
| "U," B.t.u. per hour-°F.-ft.² inside area | 90 | 150 |
| LMTD, °F. | 60 | 84 |
| Area required (inside), ft.² | 2,100 | 900 |
| Capital investment: | | |
| Cooling tower (pro rata share, 1,135 g.p.m. for 10,000 g.p.m. tower at $200,000 complete) | ..... | $22,700 |
| Exchangers, carbon steel installed complete | $31,500 | 4,100 |
| Total capital investment | $31,500 | $26,800 |
| Operating costs (annual): | | |
| Cooling-water makeup and treatment at $0.005 per 1,000 gal. cooling water circulated | ..... | $3,000 |
| Power at $0.006 per kw.-hr. | $2,900 | 2,400 |
| Depreciation: | | |
| 7% on exchangers | 2,200 | 300 |
| 5% on cooling tower | ..... | 1,100 |
| Maintenance (1% on air, 3% on water) | 300 | 800 |
| Total operating cost per year | $5,400 | $7,600 |
| Return on investment, 10% after federal tax at 50% | 6,300 | 5,400 |
| Total operating cost and profit | $11,700 | $13,000 |

Notes: (1) A 10,000-g.p.m. cooling tower with 105° to 85° F. range is assumed. (2) Cost of $200,000 is assumed for towers, basin, circulating facilities, and treating equipment. (3) The design ambient air temperature used for the air-cooled exchangers is 100° F. (4) Effect of low air-side heat-transfer coefficient for air coolers is evident. Even with extended surface area on the outside of the tube, the over-all coefficient is usually less than for shell-and-tube exchangers in condensing service. (5) Also, the lower cooling-water inlet and outlet temperature (20° F. rise) as opposed to the air is evident in the LMTD.




**AIR VS. WATER COOLING**—The five cases noted in the text, together with other services, are shown to indicate the trend. A plot of this nature for a given plant can be useful for rough comparisons on new installations, since condensing temperature has a greater effect on economics than most of the other variables considered. Fig. 1.

**Coolant supply . . .** Where water supply is inadequate, even for makeup, the air-cooled exchanger can be quite valuable.

**Weather and condensing temperature . . .** Water from a cooling tower will be available at a temperature somewhat lower than ambient air temperature during the summer months. This one factor can be quite important where condensing temperatures are low. High condensing temperatures are more favorable for air.

**Installation costs . . .** For the air-cooled exchanger, in a given service, installation costs will not be higher necessarily than for a shell-and-tube plus a pro rata share of the cooling-water facilities. If condensing temperatures are high, the installed costs for cooling-water units usually will be greater than for air units. Size of cooling tower and other related facilities is a function of the heat duty only, once cooling-water temperature range has been established. But the upper limit to which the air can be heated is governed only by temperature approach.

Conversely, a low temperature of condensation increases the required surface area of both a shell-and-tube exchanger and an air-cooled unit. Since the pro rata share of the cost of cooling water is a function of heat load, the over-all cost for the shell-and-tube installation will be relatively low. The cost of the air-cooled unit

auxiliaries, structure, foundations, fans and drivers will increase proportionately with the surface area, making the total cost higher than the cooling-water unit.

**Water-treating costs . . .** Treatment of water in recirculated cooling-water systems varies as widely as the scope of the problems—such as scaling, corrosion, and algae growth. Since these problems are not encountered with air-cooled exchangers, this one item (treating costs) could swing the economics in favor of the air-cooled unit.

**Power costs . . .** As noted, cost of cooling-water facilities is basically a function of heat load while the air-cooled exchanger auxiliary cost depends (to a large degree) on condensing temperature. Therefore, a flat statement that power costs are greater for one route over the other cannot be made. An over-all breakdown must be made for the particular plant or service.

**Space and location . . .** Air-cooled exchangers require considerably more space. But space problems can be diminished by installing such exchangers above pipeways, with the exchanger support as part of the pipeway support. However, the location of a cooling tower and allied equipment may not be so easily solved.

**Maintenance costs . . .** In this respect the air unit nearly always shows a distinct advantage. For our particular installation (Celanese at Pampa, Tex.), the maintenance on the air units, excluding corrosion or fouling due to the process fluid, is about 30% of that for the cooling-tower installation.

**Blowdown disposal . . .** Cooling-tower blowdown disposal can pose a costly problem in certain areas. The air-cooled exchanger is exempt from these problems.

### What Are the Economics?

The effect on economics of the factors just discussed is influenced largely by the type of plant and location. [In the original paper, five different cases, taken from Celanese operating experience, were presented. Since all five tables were of the same form, only one—that for condensing methanol at 15 psig.—is reproduced here to show the method of evaluation. The five different condensing services considered were: (1) acetic acid, (2) a mixture of low-boiling organic materials, (3) exhaust steam, (4) methanol at 15 psi., and (5) methanol at atmospheric pressure. These gave varying results for air vs. water cooling.]

For example, in the case of condensing methanol at 15 psig. (see table), installed costs are less for water but operating costs are higher. Using a 10% return on investment after taxes, the air route is more economical.

For condensing methanol at atmospheric pressure, however, a different picture results. Installation as well as operating costs are higher for air and the economics point to cooling water.

### Water-to-Air Ratio Plot

An interesting plot can be made of condensing temperature vs. a ratio of the total of operating costs and return on investment for water to air. (Fig. 1.) Higher cost of exchanger bundles as compared to total installation cost for air is evident in services where stainless steel is required. In carbon steel or other less expensive alloys, the economic break point appears at a lower condensing temperature. At the Pampa plant, an increase of about 15° F. in condensing temperature is necessary to reach the break point where stainless-steel bundles are used.

---

# Microwave replaces wire-line system for IPCO in Peru

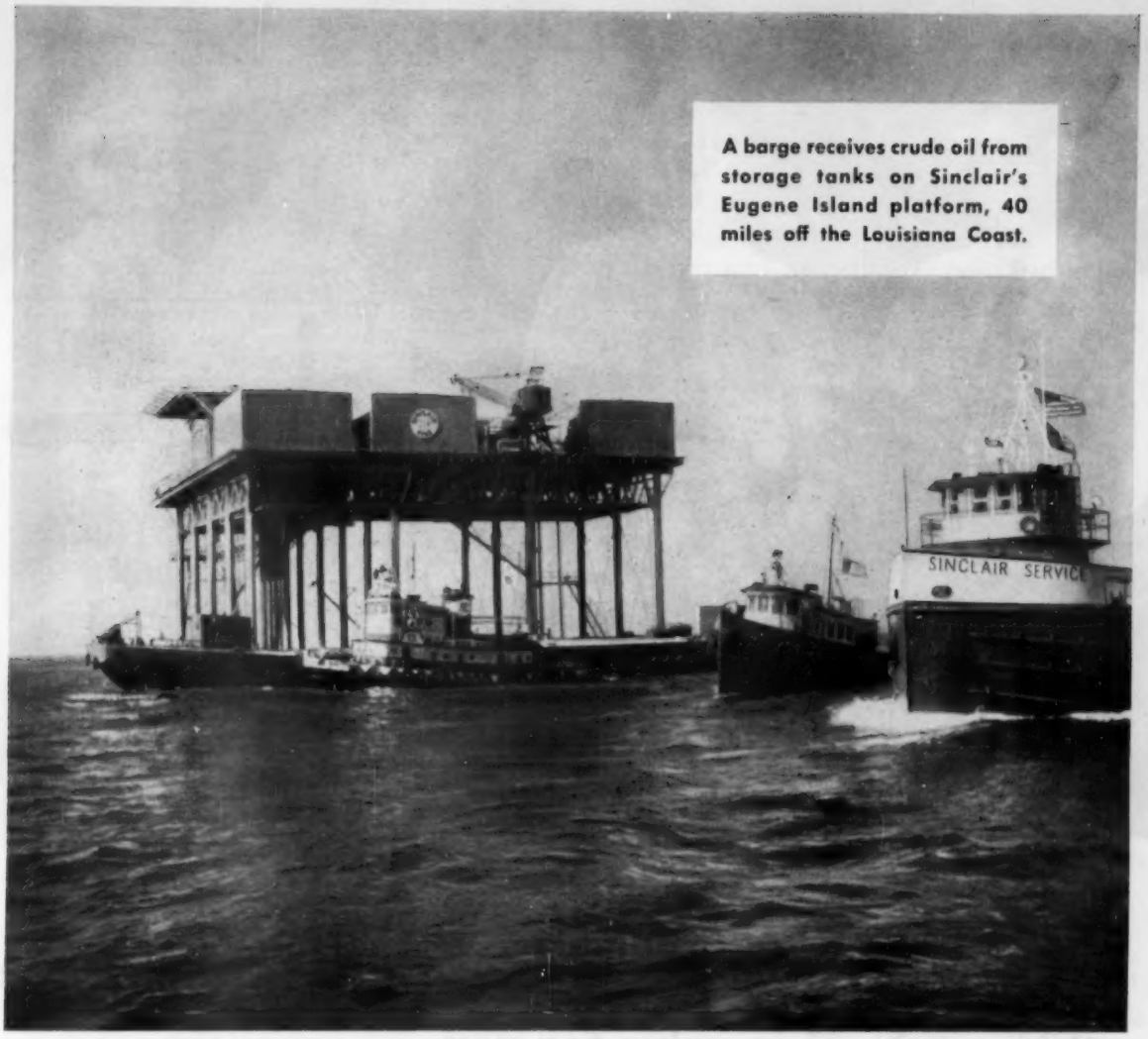
PERU'S ONLY MICROWAVE system is operated by International Petroleum Co. Covering 22 miles, the two-station, one-hop system provides communications between IPCO's oil-production and refining activities in Talara and its production field offices in El Alto.

The system was installed early in 1958 by V. M. LaPierre & Cia. S.A., Lima, Peru. LaPierre provides system maintenance for the microwave system and also IPCO's two-way radio network.

The microwave system, which operates on frequencies in the 6,000-mc. region, provides 12 voice channels. These are used for telephone communications and terminate in IPCO's PBX switchboards in Talara and El Alto. Motorola FM multiplex equipment and MR-10 RF equipment is used throughout the system.

The microwave replaces a one-pair wire line between Talara and El Alto. The need for additional communications capability prompted installation of the expandable microwave. While 12 channels are now in use a total of 24 can be multiplexed with this type of equipment.

As the first system in Peru, the IPCO microwave is providing a good example of the advantages of this medium in flexibility, reliability, and easy maintenance.




A barge receives crude oil from storage tanks on Sinclair's Eugene Island platform, 40 miles off the Louisiana Coast.

# The Case of the Disappearing Derricks

Out in the Gulf of Mexico, some oil drilling derricks have disappeared. Offshore platforms look strangely bare. What's going on? Is the search for oil stopping in this promising area? Hardly. Actually, disappearing derricks mean that some of the promise is being realized; *oil has begun flowing to market.*

When the derrick comes down on a Sinclair Oil & Gas Company platform, it marks the transition from oil exploration to oil production. On three platforms which Sinclair operates for itself and three other companies, there now are a total of 10 oil wells in production and 4 gas wells shut in.

In relation to Sinclair's total crude oil output, *which reached a record high in 1958,* present production from 10 offshore wells is the proverbial drop in a bucket. But the start of production on this new oil frontier indicates that offshore oil will one day contribute importantly to the company's raw material supply and is another step forward in Sinclair's production expansion program.

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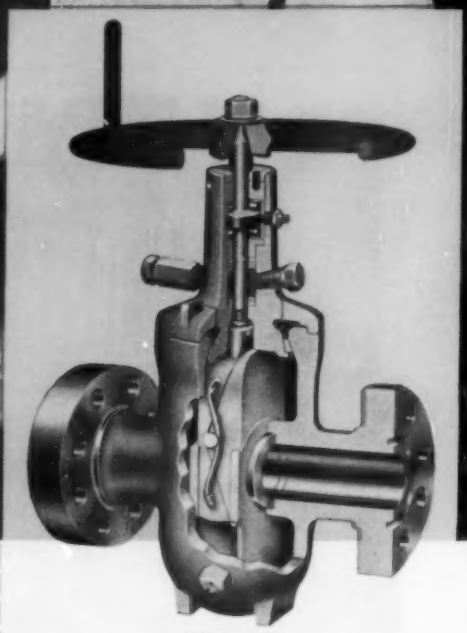

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# Sensitivity and susceptibility of alkylate

BY W. L. NELSON
Technical Editor and Petroleum Consultant

**What is the relationship between research and octane numbers for alkylates and how does tetraethyl lead affect the octane numbers?—R.A.R.**

Only a small amount of literature exists because for many years the rich mixture or performance number methods (F-3 and F-4) were used. However, the 14 references listed below provided about 13 sets of good research octane data and 3 sets of motor octane data. The research octane data were smoothed and they are summarized in Table 1 and Fig. 1. Note that octane numbers are shown in Table 1 in terms of the Wiese scale, but approximate amounts of TEL used with isooctane are also shown. Most samples showed a slightly greater effect of tetraethyl lead than shown in Table 1, but three samples had a definitely poorer lead response.

The effect of TEL on motor octane numbers is not shown because only three sets of good data were available. However, in general the effect of TEL is greater than shown in Table 1 for the research method. At 1 ml. TEL the increase is greater by about 1 unit than shown in Table 1, and with 3 ml. TEL the increase is 2-4 units greater.

Octane numbers (clear) by the research method are about 2 units higher than by the motor method. The sensitivity varies somewhat with octane number level, as follows:

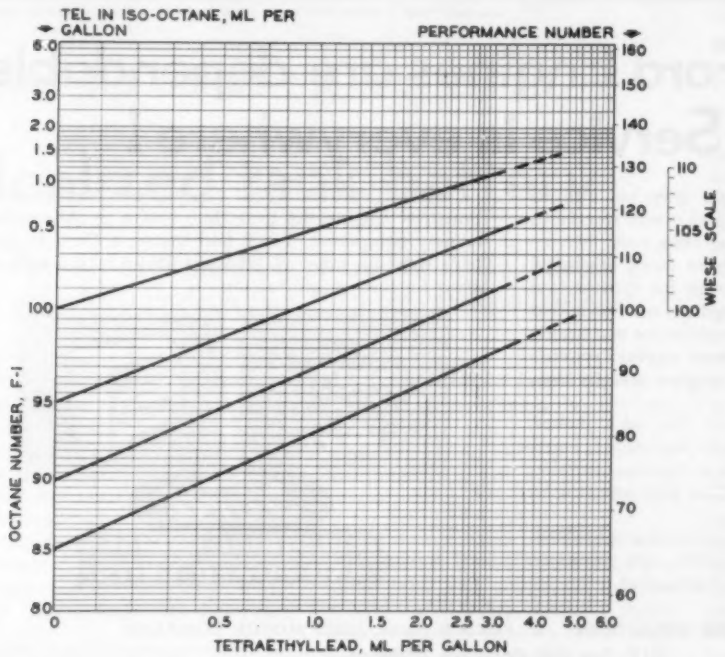
| Motor | Research | Sensitivity |
|---|---|---|
| 87 | 88.6 | *1.6 |
| 89.8-93 | 91.6-95 | †1.8 |
| 94-95 | 96-98 | *2.5 |

*Average of 5 tests. †Average of 16 tests.

TABLE 1—LEAD SUSCEPTIBILITY OF ALKYLATES (RESEARCH METHOD)

| Clear† | With 1 ml. TEL: Iso + ml. | With 1 ml. TEL: Oct. No. | With 1 ml. TEL: Increase in Oct. No. | With 3 ml. TEL: Iso + ml. | With 3 ml. TEL: Oct. No. | With 3 ml. TEL: Increase in Oct. No. |
|---|---|---|---|---|---|---|
| 85 (83.5) | ... | 93.1 | 8.1 | ... | 97.7 | 12.7 |
| 86 (84.5) | ... | 93.9 | ... | ... | 98.4 | ... |
| 87 (85.4) | ... | 94.8 | 7.8 | ... | 99.1 | 12.1 |
| 88 (86.3) | ... | 95.5 | ... | ... | 99.8 | ... |
| 89 (87.3) | ... | 96.3 | 7.3 | ... | *100.5 | 11.5 |
| 90 (88.2) | ... | 97.0 | ... | 0.09 | *101.2 | ... |
| 91 (89.2) | ... | 97.7 | 6.7 | 0.14 | *101.9 | 10.9 |
| 92 (90.2) | ... | 98.4 | ... | 0.20 | *102.6 | ... |
| 93 (91.1) | ... | 99.1 | 6.1 | 0.27 | *103.3 | 10.3 |
| 94 (92.0) | ... | 99.8 | ... | 0.36 | *104.0 | ... |
| 95 (92.5) | 0.04 | *100.5 | 5.5 | 0.47 | *104.8 | 9.8 |
| 96 (93.5) | 0.11 | *101.2 | 5.2 | 0.60 | *105.7 | 9.7 |
| 97 (94?) | 0.20 | *102.1 | 5.1 | 0.75 | *106.8 | 9.8 |
| 98 (95?) | 0.31 | *103.3 | 5.3 | 0.92 | *108.0 | 10.0 |
| 99 (95.5?) | 0.43 | *104.5 | 5.5 | 1.12 | *109.2 | 10.2 |

*Wiese scale. †Motor method octane number in parentheses.




**APPROXIMATE** lead susceptibility of alkylate. (Research octane number.) Fig. 1.

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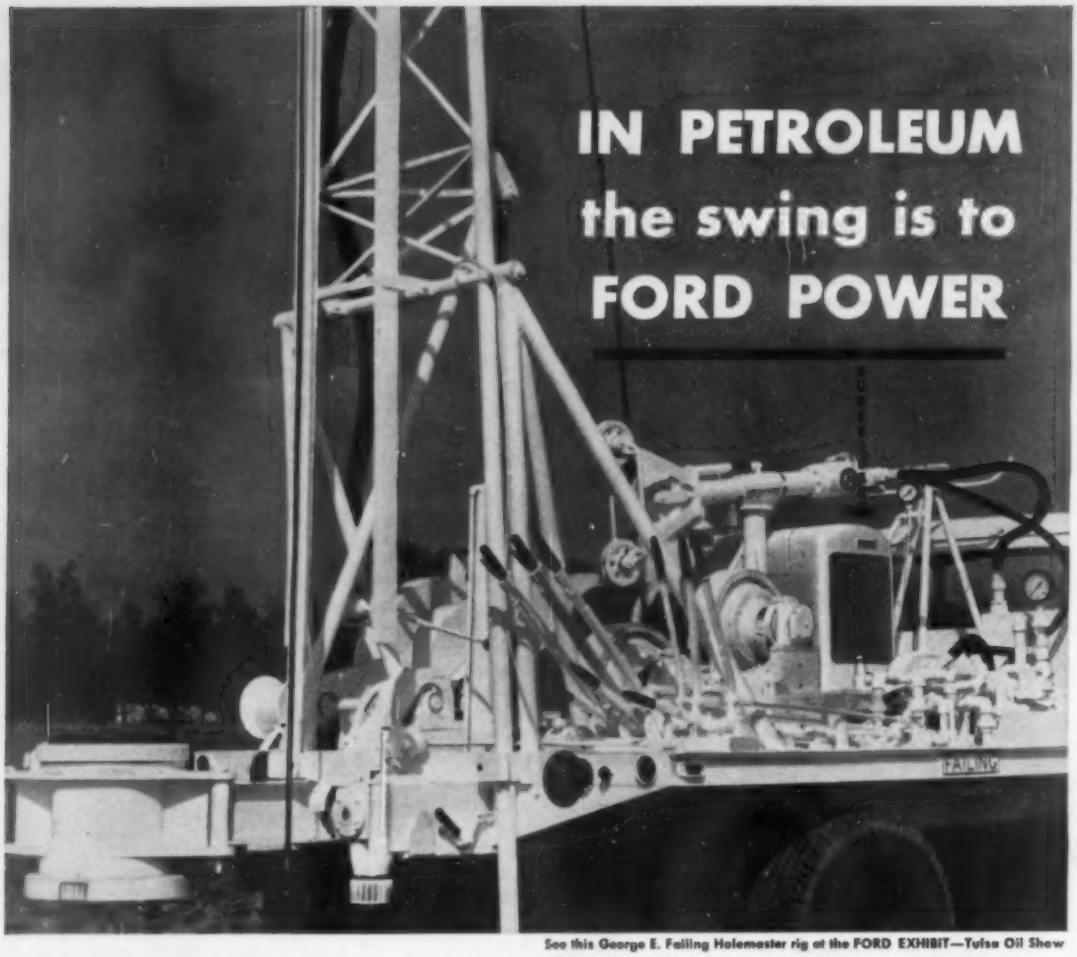


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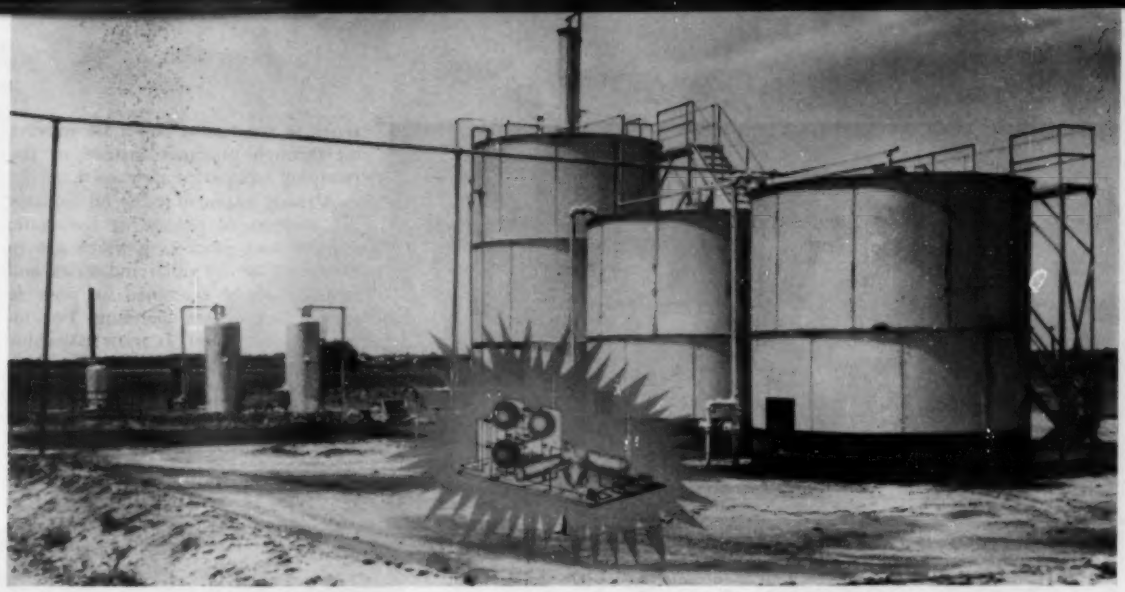
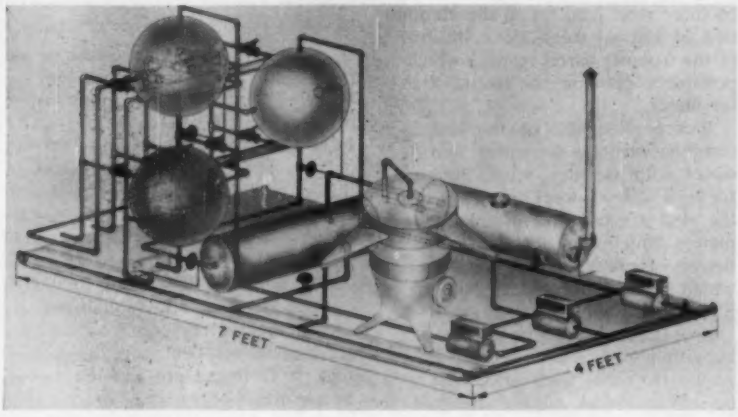


**WHAT MIGHT** well be the commonplace oil-handling unit of the future is shown above in stark contrast to the equipment it may replace. Fig. 1.

## Why all this plumbing . . .




**DETAILS** and probable dimensions of the skid-mounted unit are shown at left. Fig. 2.

## When this will do the job? It's an

# Idealized tank battery

### Cost of lease handling of crude can be reduced only through departure from conventional design

BY STEPHEN S. BROWN
Humble Oil & Refining Co., Houston

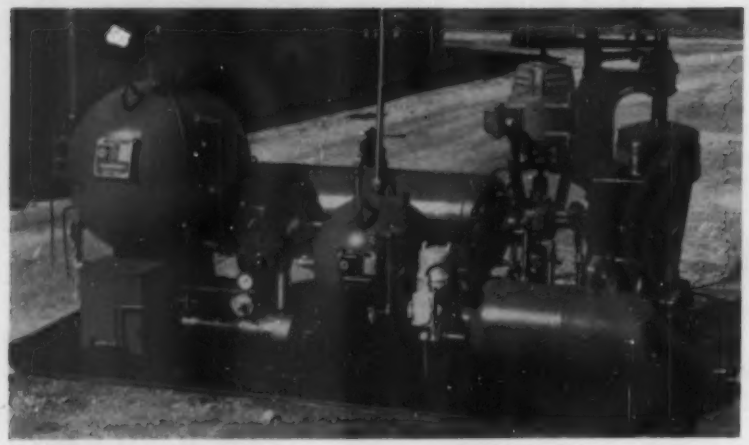
IN THE LIGHT of current and probable future domestic production rates, it is imperative that we look at the surface oil-handling equipment and methods in a very realistic manner. Our thinking must break away from the conventional and we can no longer enjoy the luxury of overdesigning in regard to capacity, in case production rates are increased sometime in the future. This means that equipment must be sized in units or modules so that capacities can be increased by simply adding more units when and if needed.

We cannot hope to reduce costs much further if lease facilities are custom-tailored and custom-built by expensive one-at-a-time methods. Equipment is needed which is production-line fabricated in shops to a standard in regard to capacity so that tank batteries become unitized shelf items in a supplier's warehouse. This will help eliminate the costly custom plumbing which we now do on our leases. However, before this can be done, systems and equipment must be made available which will make it possible to produce, treat, and move oil on an essentially continuous basis rather than utilize the batch-handling method now in use. The batch handling has been necessary in the past for measurement reasons mainly, and these measurement methods are cumbersome and labor consuming.

The continuous rather than batch measurement means an automatic custody transfer system for the measurement of oil. It also means obtaining, on the lease, a record of production and sale of oil which is in such form that a very minimum of correction, checking, and accounting work is necessary for the proper and complete maintenance of required records.

Several systems of automatic measurement of oil have been developed and are either in use or on test. Two in particular lend themselves well to incorporation into unitized lease-production facilities. These are the positive-displacement meter of the familiar rotary type and the positive-volume measuring tank. These two systems are particularly adaptable because they can operate continuously and at comparatively high rates with small physical size. Both systems have consistently demonstrated accuracies greater than can be attained by conventional hand gaging. These systems will eventually replace most of the hand methods now used, both from an accuracy standpoint and from the economic

Presented at spring meeting, Southern District, API Division of Production, New Orleans, March 27, 1959, under the original title, "An Idealized Tank-Battery Design."



**AN ACTUAL FIELD UNIT.** Tests show that G forces should be in the 3,000 to 5,000 G range for centrifugal separation to be effective. Fig. 3.

standpoint. Designs incorporating some of the newer ideas have been made. In order to be specific as to size and capacity, a production rate of 100 bbl. per day as an average battery-flow rate will be assumed. This is undoubtedly high from an industry-wide standpoint. This flow rate is better viewed when it is called 3 g.p.m. In order to take care of instantaneous flow rates resulting from heading and possible water production, this rate is raised to 300 bbl. per day or 9 g.p.m.

Fig. 2 is a 9 g.p.m. production facility. This skid-mounted unit contains the well manifolding, which is reduced in size from current practice to 1 in. An oil and gas separator, an 18-in. sphere, is mounted downstream of the manifold. From the separator, production flows through a free-water knockout if required, then through a heater measuring approximately 12 by 36 in. and having a 50,000 B.t.u. per hour rating. From the heater, production flows into a power-driven centrifuge from which emerge two streams, one water and the other clean oil.

One of the reasons for incorporating a centrifuge is that to date no completely satisfactory method of measuring the b.s. and w. content of crude has been devised which can automatically correct a meter reading for b.s. and w., thus giving true net oil. Because b.s. and w. cannot at present be measured satisfactorily, it is eliminated so there is no correction factor to be applied. The automatic-custody-transfer device which corrects its readings for temperature now gives a measure of production which requires no computation at all. The use of a power-driven device to separate oil and water may at first seem a backward or complicating step. However, the power requirements are small, 2½ hp. in the unit shown; and the cost is approximately the same as the standard oil-treating system usually installed. The maintenance and operating cost should be more than paid for in the elimination of clerical work alone by virtue of the true net barrel reading which is possible to get from the custody-transfer meter.

Incorporated also on the unit is a combination test separator and test meter with sampler, which are used for well test purposes. Shown also on the skid are test and production gas meters which are unconventional in design. These are mass flow meters which measure the gas throughput as mass or pounds. No correction for temperature or pressure is necessary. Specific gravity is necessary to convert pounds to cubic feet, but it may well be advantageous to use the weight measurement for gas. If sold on a weight basis, the return may represent more truly the actual value of the gas. This is so because the heavier the gas, the more heat value or B.t.u. content it has, and also the more valuable a source of petrochemical raw material it is.

In the background, Fig. 1, for comparative purposes, is shown the present standard tank battery which this unit replaces. It is estimated that the unitized production facility can be installed for approximately 50% of the cost of the old-style battery. In addition to the advantages previously enumerated for this type of installation, other possible advantages may become more apparent after such units are tested. One of these is the possible handling of oil from wellhead to refinery at elevated pressure, thus eliminating all weathering losses. Another is the continuous use of full pipeline facilities which should enable gathering and transporting systems to be designed smaller. Also, in many cases separator pressure which now is being dissipated on the lease may furnish much of the motive power for moving oil through pipelines instead of the pumping equipment now used.

Already available to the oil industry are systems of remote or automatic control data processing which are in everyday use by other industries and which must be examined for possible use in our future planning. For instance, equipment is now available which will take the various meter readings from production facilities, reduce them to machine-sensible form, and transmit them directly to computers and accounting machines for final processing. Decision-making devices are available or can be designed to control wells from such stimuli as purchaser demand on gas wells, changing flow rates because of high ratio of water or gas, and various lease emergency requirements. The use of this type of equipment awaits only the economic justification, which cannot come on a piecemeal basis but must be designed for entire system utilization.

In Fig. 3 is close view of the actual field unit. The centrifuge shown has been field tested in order to determine whether centrifugal separation can be successfully applied to oil-field production and what the limitations of this method are. Two things have been determined. First, each crude oil has a range of centrifuge speeds, or G forces which it can tolerate. If the G forces get too high, solid materials such as paraffin and asphaltenes are thrown out of the crude oil and are retained in the centrifuge bowl. Second, if G forces are too low, insufficient time is available for complete removal of water. Limited testing of several crude oils has indicated that this range of G forces is in the 3,000 to 5,000 G order.

Solids production with the crude oil has presented a problem. The solid materials are removed from the liquids and are retained on the side of the centrifuge bowl, where they must be manually removed. The other alternative with sand production is to use the self-cleaning type of centrifuge which doubles the cost of the unit and reduces its economic attractiveness to the vanishing point. It is believed that basic design work on centrifugal processing machinery may be able to remove this problem.

One of the factors which adversely affected centrifuges many years ago in oil fields was the resolving of the bottom-sediment layer, which was always present. Tests which have been made currently show that the treating chemicals which have become available as recently as the past 6 or 8 months are so fast acting that the bottom-sediment problem is, to a great extent, eliminated.

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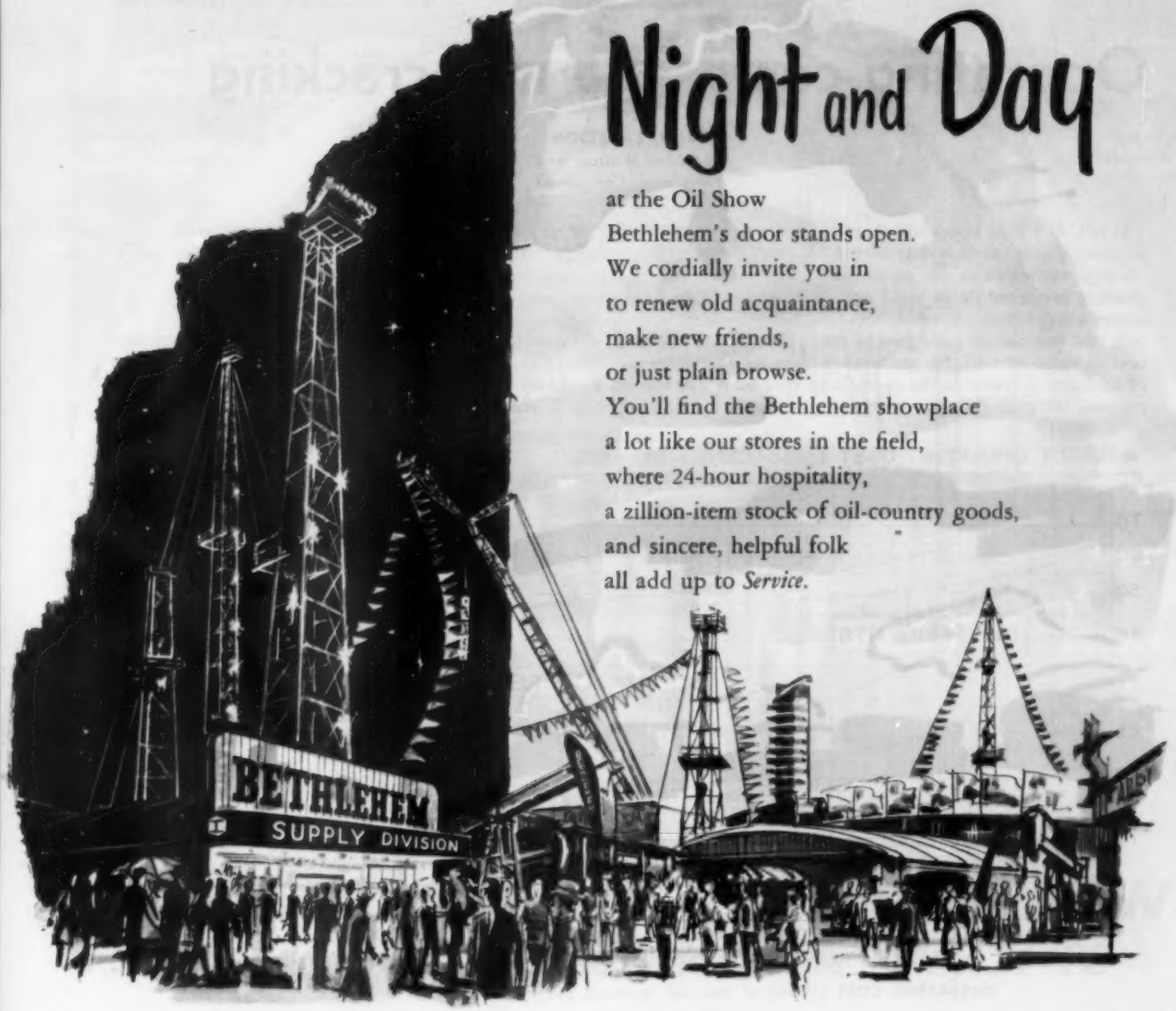


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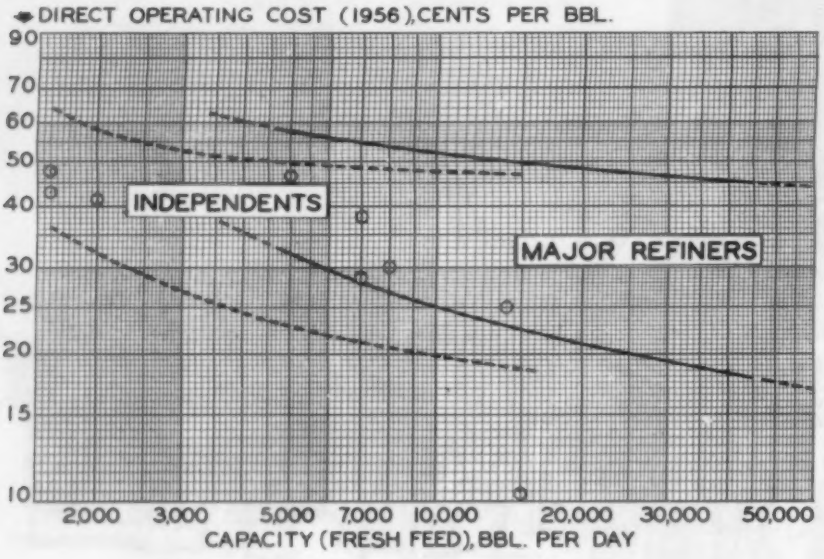
# Operating costs—thermal cracking

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

THE COST of operating thermal cracking plants varies widely because of large variations in the amount of gasoline produced (large yield necessitates a large recirculation of recycle oil), and because of variations in the cost or value of fuel. No such range of variation is found in the operating costs of the once-through operations of viscosity breaking or reforming (see Process Costimating No. 45, April 13, 1959, p. 111, and No. 56 which will be published during July 1959). Royalty is not included although a few refiners still pay royalty or its equivalent in services (3 cents per barrel, or less on a paid-up basis, Process Costimating No. 7, April 7, 1958, p. 170). Costs reported in the literature also exhibit a wide range (10.3-49 cents per barrel.).




**OPERATING COST (1956)** of thermal cracking plants.

**TABLE 1—Elements of Operating Costs—Thermal Cracking**

| Element— | Unit (somewhat standard) | 1956 Unit Cost | Cents per bbl. (10,000 b.p.d. plant) | See Process Costimating No. |
|---|---|---|---|---|
| Labor—supervision | 0.5-1 men/8-hour shift* | $3.85/hr. | 0.46-0.92* | 26, 28, 41 |
| Labor—Operating | 2.5-6 men/8-hour shift* | $3.12/hr.† | 1.87-4.50* | 26, 28, 41 |
| Maintenance | 5-6%/yr. of replacement cost | $250-320/daily bbl.‡ | 3.42-5.25 | 29 |
| Fuel | 0.4-1.0 M.M. B.t.u./bbl.§ | 25-40 ct./M.M. B.t.u. | 10.00-40.0 | 3, 4, 6 |
| Power | 0.032-0.136 b.hp.-hr./bbl.¶ | 0.9 ct./hp.-hr. | 0.69-2.94 | 13, 14, 21-23 |
| Steam | 6-10 lb./bbl.¶ | 45-60 ct./M. lb. | 0.20-0.60 | 17, 18 |
| Water cooling | 180,000-550,000 B.t.u./bbl.‖ | 1.7 ct./M. gal.‖ | 1.20-3.75 | 15, 16 |
| Chemicals | (lime, inhibitors, etc.) | | 0.10-0.20 | |
| Compression | (gas handling is charged to gas recovery plant) | | ..... | |
| | Total Direct Cost (probable extremes) | | 19.80-52.60 | |
| Obsolescence | 1%/yr. of replacement cost | $250-320/daily bbl.‡ | 0.68-0.88 | |
| Insurance and taxes | 2%/yr. of replacement cost | $250-320/daily bbl.‡ | 1.37-1.75 | |
| Interest or dividends | 4%/yr. of replacement cost | $250-320/daily bbl.‡ | 2.74-3.50 | |
| Laboratory overhead | 0.2-0.4 man/shift* | $3.12/hr.† | 0.15-0.30 | 26 |
| | Other possible indirect costs | | 5.20-6.20 | |

*Lowest figure is an average for independent refiners and large figure for government-operated plants or major refiners. †Average U.S. wages plus 27% for all burdens. ‡See Costimating No. 28, April 15, 1957, for cost of 10,000-bbl. per day plant. §Heat developed—the heat absorbed is lower by the amount of the efficiency of the heater. ¶Assuming feed and bottoms pump are steam driven. Very large amounts of steam are required if the recycling is also done with a steam-driven pump (50-192 lb./bbl.). ‖250,000 B.t.u./1,000 gal. at a rise of 30°F.

## References

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2. Kraft et al., The Oil and Gas Journal, May 22, 1941, p. 110.
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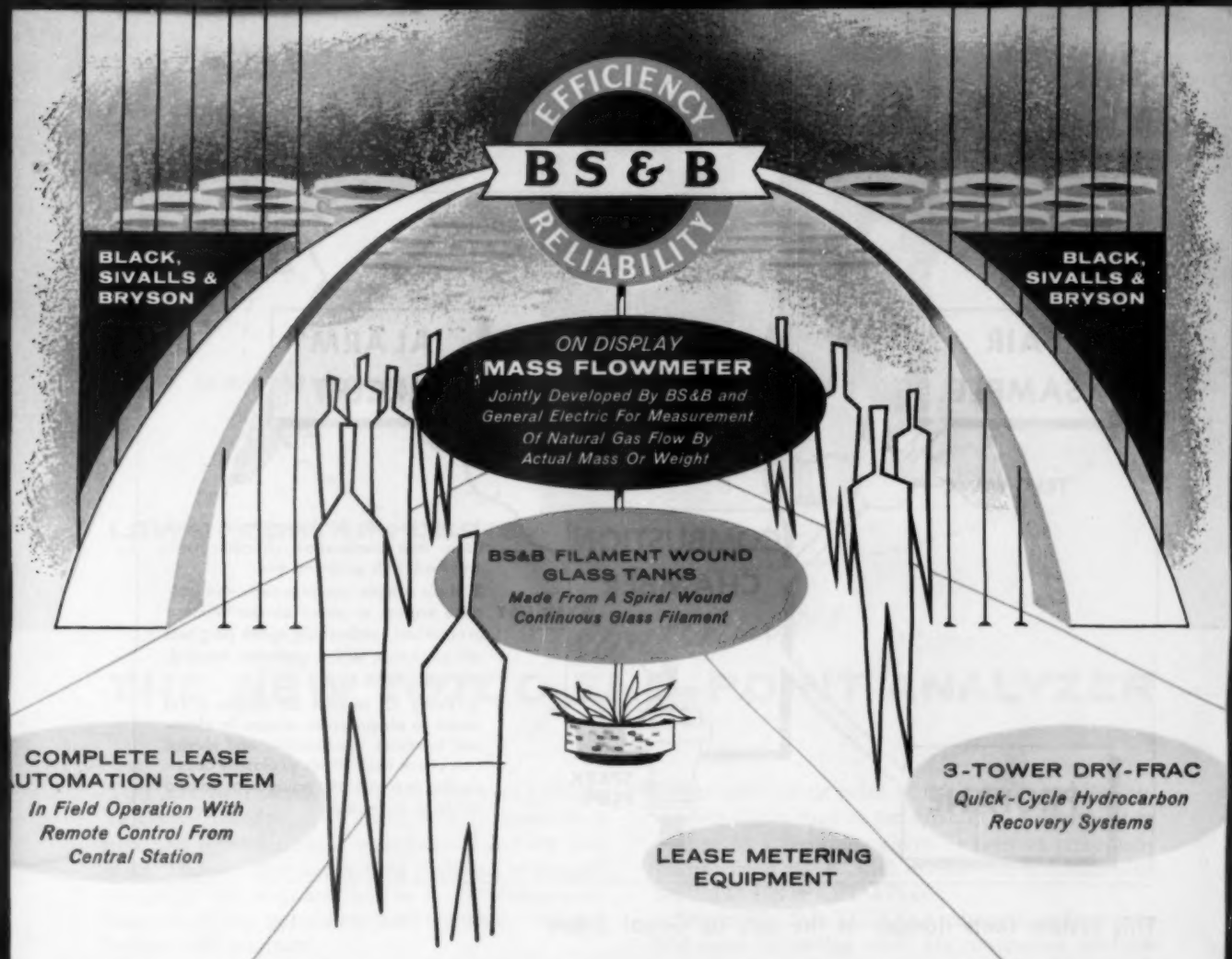
8. Smoley, E. R., Ref. Nat. Gaso. Mfr., May 1938, p. 184.


EFFICIENCY
BS&B
RELIABILITY
BLACK, SIVALLS & BRYSON
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ON DISPLAY
MASS FLOWMETER
Jointly Developed By BS&B and General Electric For Measurement Of Natural Gas Flow By Actual Mass Or Weight
BS&B FILAMENT WOUND GLASS TANKS
Made From A Spiral Wound Continuous Glass Filament
COMPLETE LEASE AUTOMATION SYSTEM
In Field Operation With Remote Control From Central Station
3-TOWER DRY-FRAC
Quick-Cycle Hydrocarbon Recovery Systems
LEASE METERING EQUIPMENT

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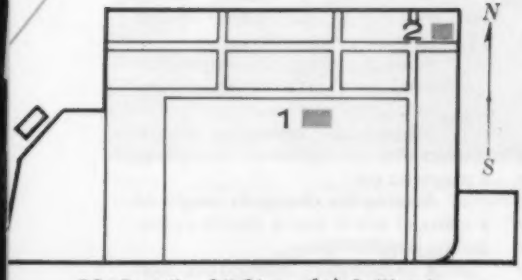
## *Tulsa, Oklahoma · May 14-23*

SKID-MOUNTED WELLHEAD GAS PROCESSING UNITS

Included as a "first showing" will be the revolutionary new mass flowmeter for natural gas measurement by actual mass or weight . . . and a completely new type of tank made from a spiral wound continuous glass filament.

Also featured will be a BS&B lease automation system in operation. At BS&B's North Area exhibit (Block 208), you will see lease operations being performed automatically, with remote control from well test and LACT programmers located at a central station in our California Building exhibit. Many other products in the fields of gas processing, lease automation, liquid level, pressure and flow control will also be on display.

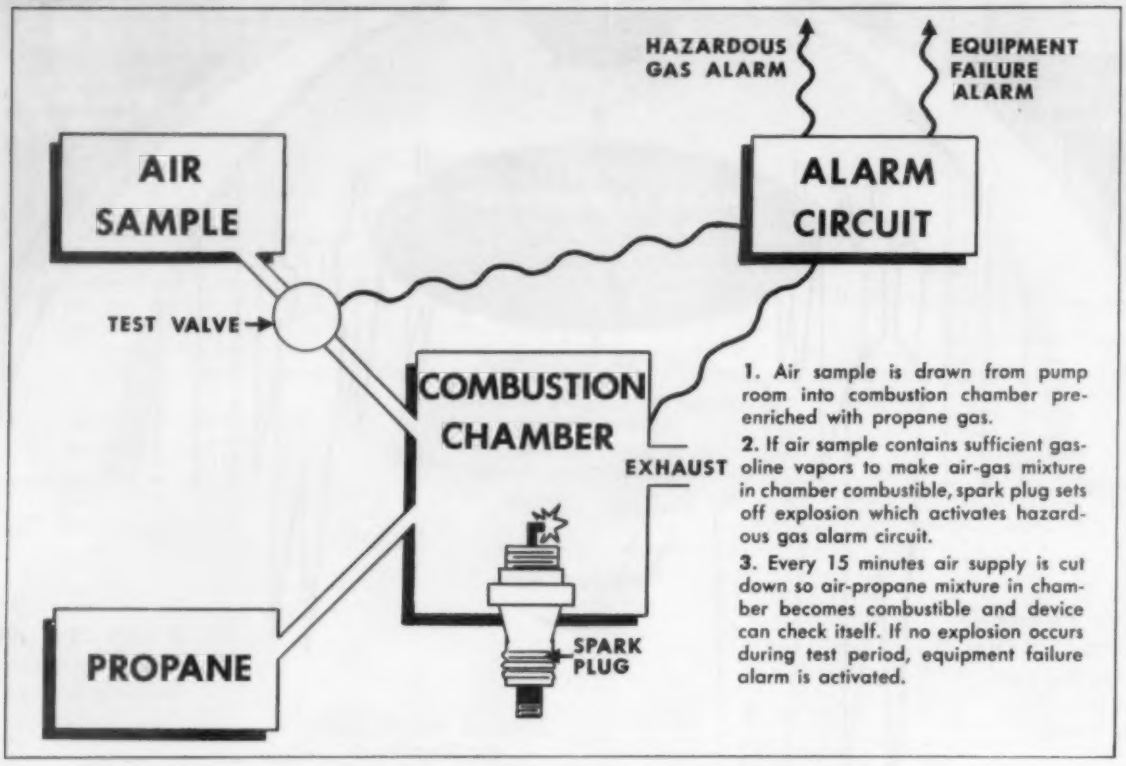



*BS&B at the Oil Show: (1) California Building (2) Block 208, North Area*

*Be sure to visit BS&B at both locations!*

## BLACK, SIVALLS & BRYSON, INC.

*Product Research and Development to Meet the Industry's*
NEEDS OF TODAY AND TOMORROW


HAZARDOUS GAS ALARM
EQUIPMENT FAILURE ALARM
AIR SAMPLE
ALARM CIRCUIT
TEST VALVE
COMBUSTION CHAMBER
EXHAUST
SPARK PLUG
PROPANE
1. Air sample is drawn from pump room into combustion chamber pre-enriched with propane gas.
2. If air sample contains sufficient gasoline vapors to make air-gas mixture in chamber combustible, spark plug sets off explosion which activates hazardous gas alarm circuit.
3. Every 15 minutes air supply is cut down so air-propane mixture in chamber becomes combustible and device can check itself. If no explosion occurs during test period, equipment failure alarm is activated.

This system feels danger in the air, as Great Lakes'

# Mechanical watchdog

## guards against gasoline vapors

A COMBUSTIBLE-ATMOSPHERE detector which protects against explosions resulting from gasoline leaks in remote-controlled pump stations has been perfected by Great Lakes Pipe Line Co. The device has these advantages, the company states:

. . . **Better reliability** than certain other types.

. . . **Cost compares very** favorably with commercial equipment.

The detector consists of a combustion chamber, located outside the building, in which a near-explosive atmosphere is maintained. An air sample is drawn from a trench near the pump into the chamber, in which a spark occurs 24 times each minute. If the atmosphere is combustible, there is a slight controlled explosion. It transmits a signal to the control point to shut down and lock out the station.

The indicator was installed at the Topeka, Kans., station October 28, 1958. Experience since that time has encouraged the company to go ahead with plans to install it in the other automatic stations at Prophetstown, Lee, Donahue, and Roland.

**Research . . .** The problem of finding a dependable indicator was given to R. R. Hancox, director of research; Vern Klein, supervisor of laboratory research; and Roy James, then director of safety and now assistant to the manager of the operating division.

After looking at many prospects, they narrowed the list to eight which the research department considered promising. Among these was the spark chamber which, after further review, was selected as the best candidate.

The ideas also considered were:

. . . **Maintaining a uniform flame** and detecting an atmosphere change which could be transmitted.

. . . **Sensing a change in oxygen** content in the air. (The entry of gasoline vapor would lower oxygen content.)

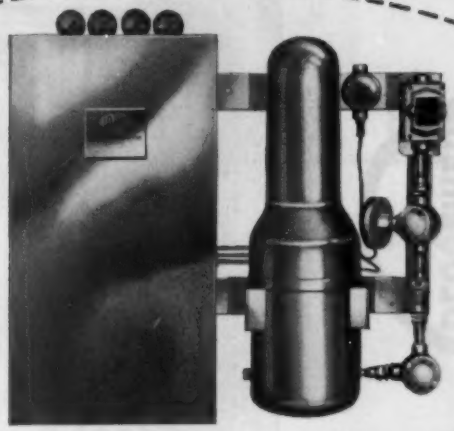
. . . **Magnetically measuring oxygen** content in a test chamber. (Oxygen is a magnetic gas.)

. . . **Sensing the change in weight** of a material which would absorb hydrocarbon vapors.

. . . **Concentrating hydrocarbon molecules** in an air sample by means of a centrifuge, and sensing their presence.

. . . **Detecting color** or other chemical change in a material sensitive to vapors.

Besides these methods of detection,



FOR MAXIMUM YIELD

LOWER CONTROL COSTS.

# THE NEW TOTCO *continuous* END-POINT ANALYZER

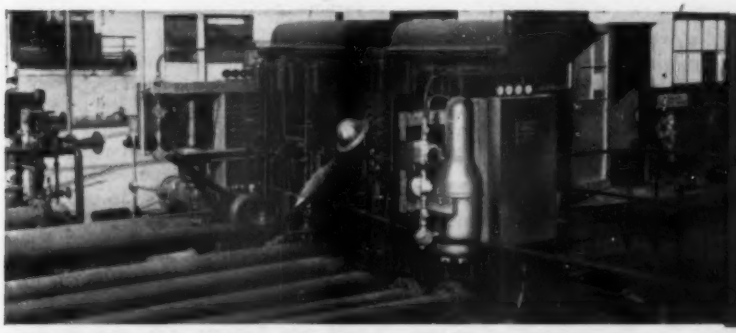
TOTCO's *continuous* End-Point Analyzer pays its own way in profits . . . by giving refinery operators a new and unique control over product quality and yield. This sensitive instrument is always on the job —right at the operating unit — for the *continuous* analysis of any petroleum product where the end boiling point is critical.

It automatically indicates the Engler End Point of a hydrocarbon stock or commodity in an operating range of 200°F. to 600°F.

The unit responds immediately to any variation in the end boiling point of the sample, and its *continuous* signal may be fed directly to a controller as well as to a recording chart. It delivers reproducibility within ±1°F., with results that correlate with ASTM D-158 or ASTM D-86.

Depend on this TOTCO Analyzer to reduce control costs by saving time. Its *continuous* analysis cuts the usual delays between quality change and compensating plant control...eliminates the time lag of batch analyzers or conventional laboratory tests.

*Write or call today for further information.*



*See the* TOTCO ANALYZER *in operation at* TULSA

*Visit the TOTCO exhibit during the Oil Show at Tulsa*

*Booth 192-193, Oklahoma Bldg.*

TOTCO continuous End-Point Analyzer in operation at Union Oil Company Refinery, Wilmington, California.

TOTCO

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**E-28 for logs 5" or less in width. Model E-27 for logs 6⅛" or less. Either holds approximately 600 reduced logs, folded and filed on edge. Easy glide drawers on ball-bearing rollers. Steel drawer dividers support filed logs.**

***KRAFTBILT File Folders available in proper size for either model.***

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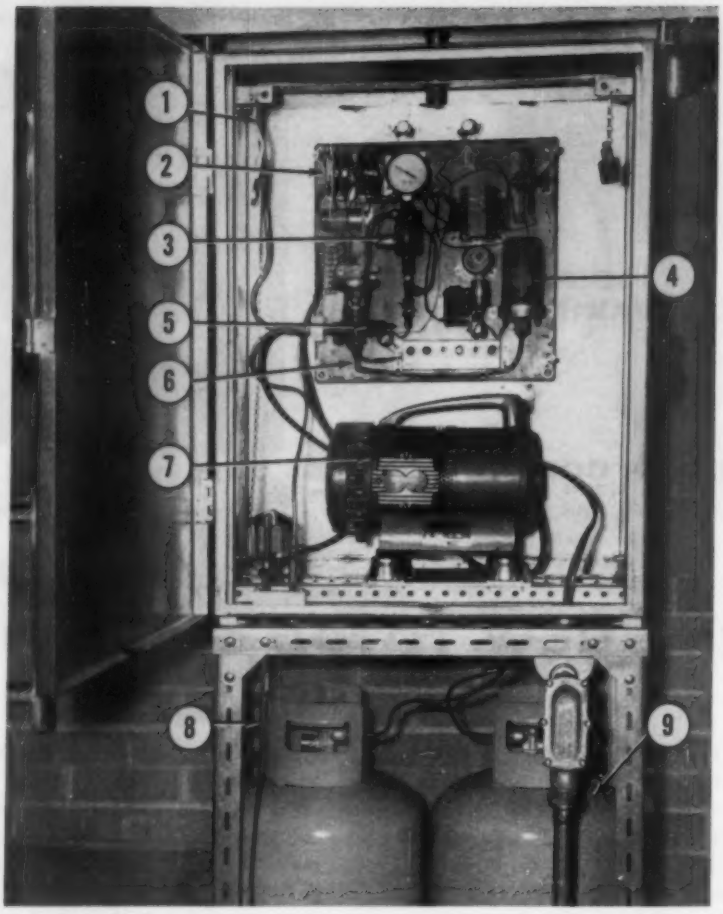



**MAJOR COMPONENTS** of the indicator are: (1) exhaust line; (2) alarm circuit; (3) test valve; (4) ignition coil; (5) combustion chamber; (6) spark plug; (7) air sample pump; (8) air sample line (the larger conduit contains the electrical wiring); (9) propane. Each propane tank lasts about a month. The full bottle automatically cuts in when the other empties, so as long as periodic inspections are made, there isn't much danger of the propane supply running out unexpectedly.

Great Lakes has had experience with a device which draws an air sample from the pump room into a machine containing an incandescent filament. If any gasoline vapors are present, the temperature of the filament rises. The more vapor in the air, the hotter the filament becomes.

The temperature change is registered on a meter. When vapor content approaches hazardous levels, the alarm is sounded. This principle is used effectively by Great Lakes in portable combustible-atmosphere indicators, or sniffers. They are adjusted before use, thereby compensating for any change in filament characteristics due to aging.

**Spark-chamber operation . . .** The design finally chosen provides for a chamber filled with propane-enriched air. Air is drawn from the pump room and propane from tanks under the indicator. Flame arrestors on the incoming lines protect against explosive feedback.

The rich mixture provides a sizable safety factor. If the air sample from the pump room contains 30% of the gasoline vapors necessary for combustion in an air-gas mixture, an explosion will occur in the chamber. Should a change in safety factor be desired, an adjustment in the amount of propane drawn into the chamber would be simple to make.

The indicator also functions to warn of fuel-oil leaks, although these vapors would not become rich enough to ignite. The air sample is taken through a tube whose mouth is only a few inches from the bottom of a trench in the pump room. A serious leak would soon fill the trench and shut off air to the tube, thus enriching the propane-air mixture so that an explosion would occur in the spark chamber.

In the early stages the detector was not hooked up to cause automatic shut-

down and lockout in the event of a leak. A trouble signal was transmitted to El Dorado, and it was up to station operators to shut down the Topeka station. When automatic shutdown is in effect, the satellite cannot be restarted until a repairman is sent to Topeka to check the trouble.

The detector also has a built-in self-checking feature. At 15-minute intervals the air supply is reduced so that an explosion will occur in the spark chamber. This signal is transmitted to El Dorado on a separate circuit from the alarm system. If there is no explosion, a signal tells the control point that the detector isn't working.

**Eliminating the bugs . . .** Reliability was the prime consideration in design of the vapor indicator. The spark plug has long life; the explosion chamber is made of brass, and other metal parts are corrosion-resistant.

Troubles in the early weeks of test operation were only minor. From time to time the spark failed, and when failure occurred during a self check, an equipment-malfunction signal was transmitted to El Dorado.

The trouble was believed to stem from water-vapor condensation. The air tube after leaving the station building is exposed to the weather. During the winter, the outside air is colder, thus raising the possibilty of condensation which would be drawn into the spark chamber.

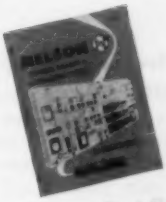
The exposed section of the tube was wrapped with a soil-heating cable and its temperature raised to about 100° F. The combustion chamber was warm enough already. In the summer, it will probably be cooled by allowing more air into the cabinet. Heating the tube probably prevented future headaches, but the immediate one persisted. It was later found to be a defective electric switch.

**Present safety measures . . .** The other unattended stations of Great Lakes which are not yet equipped with a vapor indicator are protected by a drainage system.

The packing-gland drain boxes on the pumps are connected to a sump tank. If the mechanical seals on the pump fail, leaking product will drain into the tank. Accumulation of 10 gal. of product will cause a float switch to shut down the station. As further protection against leakage, trenches in the pump room at Topeka also drain into the sump tank.

For Badger Pipe Line Company, Des Plaines, Illinois. Nelson control panels, such as shown in the top photo, provide day-in and day-out service. This particular control panel includes (1) recording potentiometer for temperature (2) flow recorder controller (3) interface detector (4) pressure gauges and (5) pressure recorder controller.

Nelson delivers a board, built to the highest standards of workmanship, completely shop tested, and individually crafted to meet customer requirements. It will be a real show piece wherever it is installed. Sheet metal work, piping, wiring, finishing are done in such a manner that you know quality has been built into your board. Nelson's engineering know-how and engineering skill combine to produce instrument and control panels unequalled for quality, service and dependability.



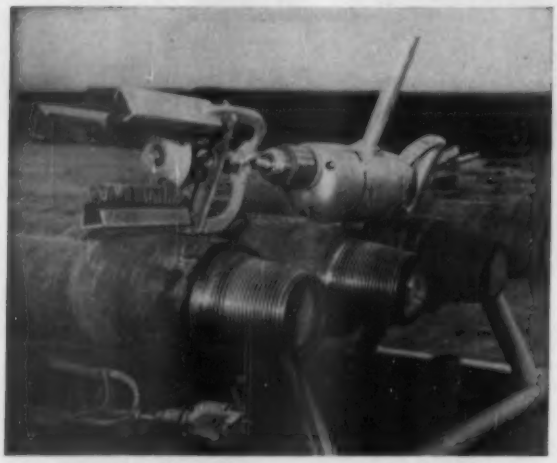
*Write for this brochure on Nelson Instrument and Control Panels It's yours for the asking.*

At Nelson . . . *quality* comes first!

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

## ▶ ▶ ▶ New Equipment Section

# This week's SHOWCASE features . . .



## Thread-cleaning tool for drill pipe

. . . as well as casing and tubing can now be obtained to handle external threads in sizes from 2⅜ through 5½ in. It can also handle tubing couplings in sizes from 2⅜ through 3½ in. and casing couplings in sizes from 3½ through 7 in.

Operation of the thread-cleaning tool is simple. It consists essentially of an expanding metal frame, bearing plate, and wire brushes. It can be driven by an air or electric drill or hand brace. Or it can be driven from a power takeoff. The wire brushes are avaliable from most supply stores and are easily changed when worn. To change brushes on the internal-thread cleaning tool, just remove a cotter pin, pull off the bearing plate, and slip out the brushes. On the tool for external threads, brush changing is even simpler—just remove a screw and slip out the brushes. Cleaning is fast. One operator can clean over 60 joints an hour.

The cleaning tool promises to make location of galled threads easier as they can be quickly spotted after cleaning. Also, clean threads are much easier to make up than those containing gritty materials. This can help cut trip time. **Contact Manufacturer: Red Label, Inc., Box 1640, Pampa, Tex., for details on thread cleaner.**

●

## Insulation for thermocouple wire

. . . has been developed that is waterproof, heat-resistant, and chemically inert. The insulation is an extrude of Teflon-FEP, a perfluorcarbon resin. Important properties of the insulation include low dielectric losses and high dielectric strength over a wide temperature range. It is thermally stable up to at least 200° C. in continuous service.

It offers resistance to all chemicals except alkali metals under certain conditions, fluorine at elevated temperature, and certain complex halogenated compounds such as chlorine trifluoride.

During tests, the insulation's tensile strength and elongation remained unchanged after 120 hours exposure at 200° C. to hydraulic fluid and one week exposure at 100° C. to fuming nitric acid. **Contact Manufacturer: Pyrometer Supplies Section, Brown Instruments Div., Minneapolis-Honeywell Regulator Co., Philadelphia, for details on Teflon-FEP thermocouple insulation.**

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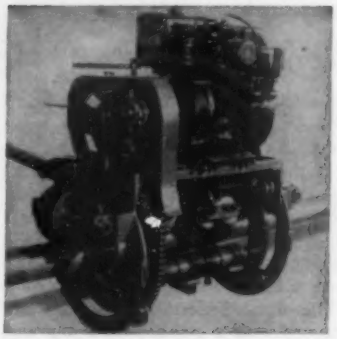

## Compact pipe-cleaning machine

. . . now in production requires only 6 in. of clearance under the pipe. It comes in five models for pipe sizes from 2 through 24 in. Capable of cleaning up to 25 ft. of pipe a minute, the machine can be easily installed by two men.

Once attached to the pipe, the self-propelled machine can be easily operated by one man. It has one reverse and two forward speeds. Machine travel and cleaning-head rotation are independent of each other so the operator can exercise complete control over the cleaning operation.

A floating design is incorporated in the machine so it will easily pass over such obstacles as collars, patches, and bell-and-spigot pipe. **Contact Manufacturer: Remco Mfg. Co., P. O. Box 3005, Tulsa, for details on pipe-cleaning machine.**


Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

Described in OIL AND GAS JOURNAL - Issue of May 4, 1959

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COMPANY.....

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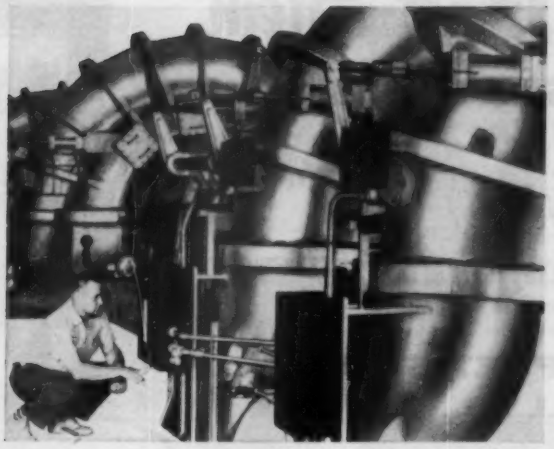
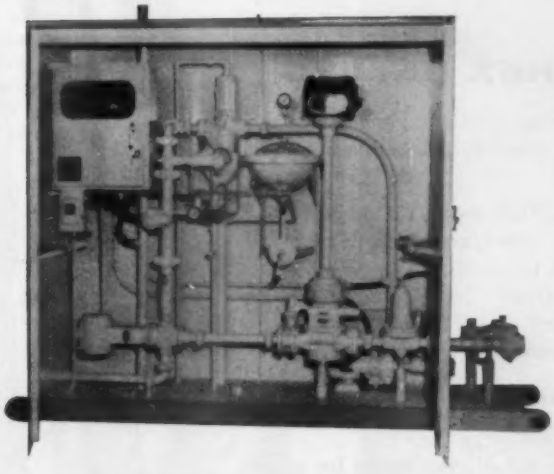


## Compressor surge control system

... recently put into production is designed to permit safe operation of large compressors closer to the surge point than previously possible. It offers a way to improve operating stability, and reduce power consumption.

It is adaptable to every mode of compressor operation and can be used on units rated at 50 hp. and higher. Completely packaged, the Compudyne system consists of electronic sensing, measuring, and control instruments along with an electrohydraulic or electropneumatic actuator and control valve as the final control elements. The system is pretested and field adjustable to obtain the best performance. **Contact Manufacturer: CDC Control Services, Inc., 747 South Warminster Road, Hatboro, Pa., for details on surge control system for compressors.**



## Automatic custody transfer unit

... handles 10 to 700 bbl. a day. It's only 2 ft. wide and 8 ft. long. Either one meter or two meters in series are available on this latest development in custody transfer units. Components include a pump, strainer, gas eliminator, b.s. and w. monitor, sampler with sample container, three-way bad-oil valve, back-pressure valve, and prover bypass.

An optional feature for its control panel is a preset counter for automatically shutting down the unit when a predetermined amount of oil has been run. The Major 700 unit is completely housed so all components are protected against tampering, dust, salt spray, snow, and other adverse conditions. The housing can be insulated and heated for cold-climate operation. All instruments are visible through the windowed doors and indirectly lighted.

No surge tank liquid-level float controls are needed with the unit. The steel-skid base incorporates an integral concrete foundation so the unit can be installed in a few hours by connecting the oil inlet, discharge, and bad oil lines, the bringing electric power to the unit.

Since the unit measures only 2 ft. wide by 8 ft. long, it can be easily hauled by a pickup truck. **Contact Manufacturer: Major Engineering Co., 1214 South Norwood, Tulsa 12, for details on Major 700 ACT unit.**

•

## Welded steelcase LPG meter

... to be available contains an internal-counter type of index for simplified meter reading. The index box has a plastic window that is designed to prevent breakage.

A mastic-vinyl finish on the Model WC-45-LPG meter prevents corrosion and eases maintenance. The removable top is soldered. The tangent can be adjusted through the meter inlet without taking the top off.

Other interesting features include one-piece nylon valve guides and molded diaphragms. Rated capacity of the meter is 45 cu. ft. an hour for propane and 40 cu. ft. an hour for butane—both at ½-in. water differential and 5-psi. working pressure. **Contact Manufacturer: American Meter Co., 920 Payne Avenue, Erie 6, Pa., for details on WC-45-LPG meter.**

•

## Winch for pipeline, production use

... has been announced for Caterpillar D7 tractors. The Hyster D7D Lo-speed winch mounted on a D7 tractor has a maximum line pull of 85,000 lb. Minimum line speed is 37 feet per minute. Optional equipment includes a fairlead and an automatic brake.

The fairlead consists of two vertical and two horizontal alloy steel rolls mounted in a frame. It allows the operator to pull from wide angles without damaging the cable. The automatic brake prevents slipback by automatically applying the brake at

# It's Not A Grief Stem

## IF IT'S A BAASH-ROSS KELLY

*Choice of*
*Square or Hexagonal Kelly...*

### "TRUBORE" UPSET SQUARE KELLYS

From alloy steel selection to anti-gall treatment each manufacturing step is quality controlled to assure long kelly life. Because of their heavy walls, "Trubore" kellys have very little flexibility. Therefore, the joint alignment is held to unusually close tolerances to eliminate risk of "working" at the joints, thus minimizing joint failures. Added length at top and bottom upsets allows recutting threads for added life.

B-R square kellys are made in various styles including the plain type. Special lengths, cross sectional dimensions or upset designs using any type of steel are available on order.

### "TRUBORE" HEX KELLYS

Because this kelly can be used without change for both regular or pressure drilling it is widely used as the standard for all drilling operations.

The Baash-Ross hex kelly has these advantages:

- Smoother running (machined to shape)
- Greater resistance to bending*
- More circulation area*
- Stronger in torque*
- Greater tensile strength*

*Based on comparable square and hex kellys.

Facilities are available in the United States for reconditioning worn hex or square kellys, and for stubbing by the Baash-Ross pressure weld method.

*PROTECT your kelly investment — use Baash-Ross Kelly Drive Bushings.*

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BAASH ROSS JOY

**SHOWCASE . . .**

# New Equipment

the instant the drum stops rotating. **Contact Manufacturer: Hyster Co., 2902 Northeast Clackamas Street, Portland 8, Ore., for details on D7D Lo-Speed winch.**

●

## Rectangular riveted grating

. . . made of aluminum is now obtainable. The grating has a clear opening of 70%. It is designed for sturdy construction, regardless of round or rectangular cutouts. Potential applications include walkway and stairs. Since the grating is made of aluminum, it is highly corrosion-resistant and sparkproof. **Contact Manufacturer: Klemp Metal Grating Corp., 6601 South Melvina Avenue, Chicago 38, for details on rectangular riveted aluminum grating.**

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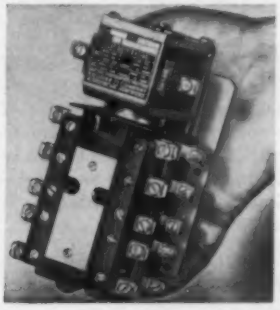


## Direct current magnetic relay

. . . now in production is compact and designed for pilot-duty applications on d.c. control panels. It is rated at 10 amp. with contact ratings of 125 volt-amp. for 126 to 600 volts and 250 volt-amp. for 26 to 125 volts.

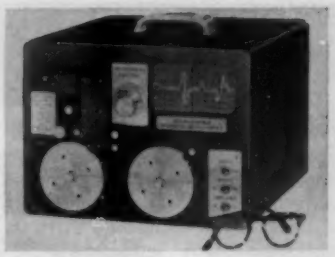
The relay comes with as many as 10 contacts. The Type D relay has the same mounting dimensions regardless of the number of contacts. **Contact Manufacturer: Square D Co. 4041 North Richards Street, Milwaukee 12, for Bulletin 7001-D.**

## Recording, projecting oscillograph

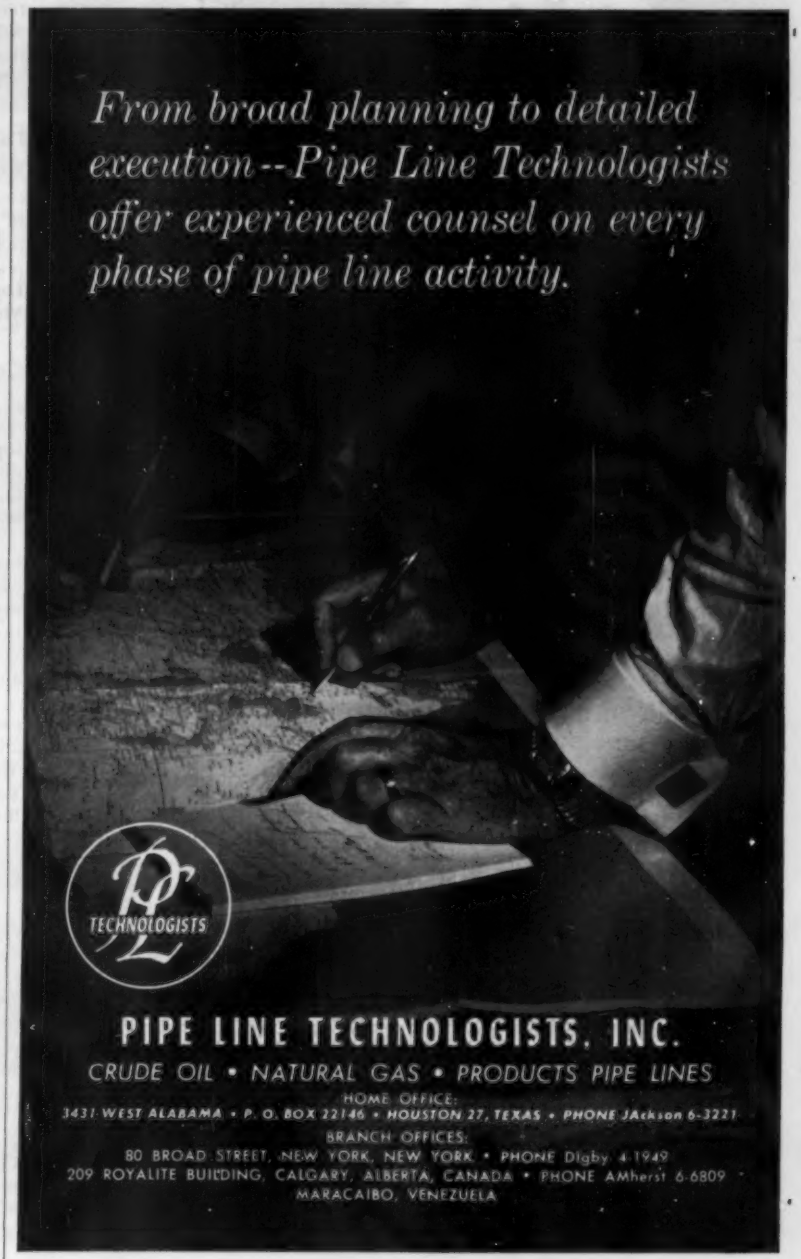
. . . now being produced puts into permanent immediate visual form any type of physical variable—electrical, optical, acoustical chemical, or thermal. Transient phenomena ranging from direct current to 5,000 c.p.s. a.c. current are permanently recorded and immediately projected as an enlarged image on a 4-in. viewing screen.

Data may be transported backward and forward for detailed visual inspection.

The instrument measures 9 in. high,



12 in. wide, and 8 in. deep. It weighs less than 15 lb. Approximate cost is $500. **Contact Manufacturer: Microsound, Inc., 4627 Leahy Street, Culver City, Calif., for details on Datascope.**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SHOWCASE . . .

# New Literature

## Level indicators and controls

. . . are outlined in new four-page Bulletin A. The bulletin contains descriptive information on liquid-level indicators, fuel-oil indicators, dial indicators, truck-tank indicators, specific-gravity indicators, manifold valves, and liquid-level controls. **Contact Manufacturer: Petrometer Corp., 43-22 Tenth Street, Long Island City 1, N. Y., for Bulletin A.**

## Drill-collar facts and figures

. . . are contained in new Bulletin D-1. The 16-page publication includes information and charts on drill-collar selection, makeup torques, and care and maintenance of drill collars. **Contact Manufacturer: Baash-Ross Div., Joy Mfg. Co., 5306 Clinton Drive, Houston, for Bulletin D-1.**

## Application of electronic controls

. . . for power-generating stations is detailed in new 12-page Bulletin E-88. It describes uses of newly developed automatic controls for sensing power loads, starting, regulating, and shutting down engine-generating units to meet varying line demands.

Photos show controls which regulate engines driving centrifugal pumps on pipelines and motor-driven gas compressors controlled for gas synthesis in chemical processing. **Contact Manufacturer: Cooper-Bessemer Corp., Mount Vernon, Ohio, for Bulletin E-88.**

## Instruments for your analytical problems

. . . are described in a new 20-page brochure. The comprehensive literature gives applications of instrumental analysis and its advantages. It tells how and why infrared and ultraviolet spectrophotometers and gas-chromatography instruments are used and the benefits obtained with them.

Typical spectra and runs and instrument schematics are used. The brochure gives details of analytical instruments, accessories, and their applications.

It also discusses how infrared and gas chromatography can be used in conjunction to obtain a complete analysis. **Contact Manufacturer: Instrument Div., Perkin-Elmer Corp., Norwalk, Conn., for Selecting Instruments to Solve Your Analytical Problems brochure.**

## Electric drive for oil-well drilling

. . . Bulletin GEA-6872 lists drive advantages as: reduction of move and rigup time; flexibility of locating equipment; positive-drilling control; and low maintenance. The 16-page, full-color bulletin explains drive-system components and illustrates typical rig installations with photographs. Performance charts show speed-horsepower, speed-torque curves, and two typical electric-drive rig layouts. The bulletin includes data on application and installation engineering. **Contact Manufacturer: General Electric Co., Schenectady 5, N. Y., for Bulletin GEA-6872.**

## Bottom-hole gage-plug tool

. . . which is removable is demonstrated in a new available two-page bulletin. The tool, used to pack off and suspend a pressure bomb at the bottom of a well, allows flow to be shut in at, or near, the sand face for pressure buildup tests, the bulletin reports.

It includes a cutaway drawing of the tool, along with a photograph and dimensional data. **Contact Manufacturer: Otis Engineering Corp., P. O. Box 35206, Dallas, for Removable Collar-Lock Tubing-Plug bulletin.**

## Loading valves and assemblies

. . . are described in new Bulletin F-49. The bulletin explains how the valves work and gives prices and sizes. A section on loading-valve assembles outlines factors that might be considered before final selection. **Contact Manufacturer: OPW-Jordan, 2735 Colerain Avenue, Cincinnati 25, for Bulletin F-49.**

## Installation cost-cutting technique

. . . for lines and vessels carrying high-temperature gases under pressure is described and illustrated in a new bulletin. It tells how Insidline, an internal-insulation method, separates the effects of temperature and pressure.

By reducing the temperature to which the steel shell is subjected, normal wall thicknesses of inexpensive carbon-steel piping can be used to carry gases having temperatures up to 2,000° F. The six-page, two-color bulletin includes photos, line drawings, graphs, and economic advantages.

It also describes mechanical construction of the internal insulation and lists service conditions required for determining Insidline specifications. **Contact Manufacturer: Insidline Div., Baldwin-Hill Co., 500 Breunig Avenue, N. J., for Insidline bulletin.**

## Diesel-powered crawler tractors

. . . are detailed in two new six-page folders—MS-1192 and MS-1284. The publications offer photos and specifications on the HD-16 and HD-16 DC and D diesel tractors.

The folders include cutaway views with marginal notes of the models being discussed, thus providing a quick reference source. **Contact Manufacturer: Construction Machinery Div., Allis-Chalmers Mfg. Co., 1126 Seventieth Street, Milwaukee, for Folders MS-1192 and MS-1284.**

## Horizontal in-line submersible pumps

. . . for booster service are detailed in new Bulletin 203. The publication stresses the pumps' uses and applications. **Contact Manufacturer: Layne & Bowler, Inc., Dept. AD, Memphis 8, for Bulletin 203.**

## Conduit and fittings

. . . booklet gives illustrated descriptions of installations in various buildings and plants. Booklet 485 tells and illustrates how galvanized conduit and tubing are made and quality-controlled.

The technical section of the 60-page literature includes: (1) conduit specifications and other data for use in estimating and planning electrical installations; (2) standard symbols and abbreviations for use on drawings; and (3) applicable electrical data.

It includes the latest ASA specifications for various types of conduit and electrical-metallic tubing. **Contact Manufacturer: National Supply Co., Two Gateway Center, Pittsburgh, for Booklet 485.**

## Controlled Mixing of Gas

. . . is the title of a new 74-page reference manual which is packed with data on gas measuring, mixing, and related control equipment. Four major chapters deal with (1) fundamentals of gas mixing, (2) typical gas-mixing control systems, (3) proportional peak-shaving and standby control, and (4) gas-jet compressor-mixing control.

Twenty-six illustrations — pictures, graphs, and drawings—are included. **Contact Manufacturer: Cutler-Hammer, Inc., 448 North Twelfth Street, Milwaukee 1, for Controlled Mixing of Gas reference manual.**

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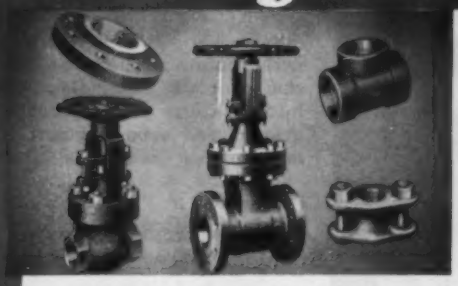

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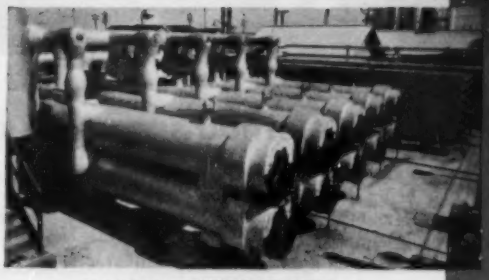

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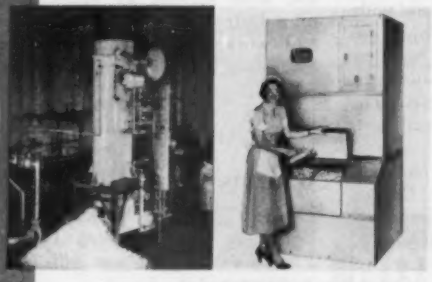

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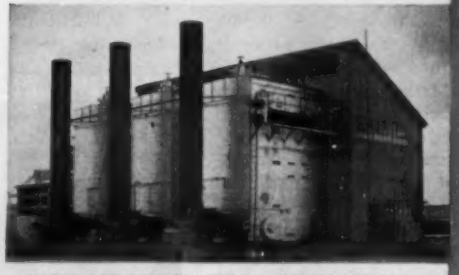

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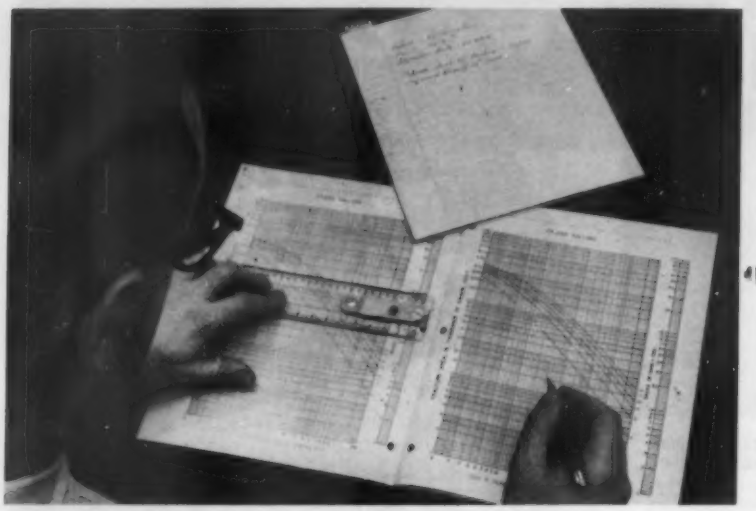


Technical manual assists as . . .

## New fracture method simplifies operation

A NEW planning method for fracturing jobs is being made available to oil men by Halliburton Oil Well Cementing Co. of Duncan, Okla. The system offers a simplified approach to complex problems—obtaining the best fracturing fluid to use for a specific formation, horsepower requirements, friction loss, treating pressures, injection rates, sand quantities, and fracture areas.

The method begins with correlating all known reservoir data, past fracturing experience in the area, and desired production figure. This information is then used with a new technical publication—A Method for Fracturing Treatment Design—which employs curves, charts, and formulas that enable the oil man to pick the fracturing treatment best for the particular well.

The specific information required includes effective permeability, core analysis, porosity, bottom-hole temperature, pressure, and viscosity of fluid, gas-oil ratio, and water production. In most cases this information is available or can be obtained from reliable sources such as drill-stem tests, electric logs, and laboratory tests.

Treatments which have been calculated by this method often indicate the need for a more efficient fluid and a greater volume of propping agent to completely pack the fracture area. Properly packing the fracture tends to prevent healing, gives better fracture flow capacity, and may minimize returning sand. When this is accomplished, better sustained production should result.

Since fluid properties with and without additives must be known in any given area, Halliburton has been engaged in an intensive evaluation program of many domestic oils. This work is available for inspection to interested oil men.

This planning system and "A Method for Fracturing Treatment Design" are not "cure-alls" but are important steps toward obtaining optimum fracture treatment of a particular well or an entire field.

### Oil Base, Inc. erects new plant

. . . at Lafayette, La., for the manufacture and supply of liquid oil-base drilling fluids. Facilities include tank-storage capacity of 3,500 bbl. for Black Magic Premix and Supermix, a warehouse for additives, bulk barite storage, and a laboratory.

Hal Farmer, district manager, is in charge of the plant. He is assisted by Steve Curry. Oil Base, Inc.'s headquarters and main plant are located in Compton, Calif.

### W. A. (Bill) Davidson is appointed

. . . general sales manager at Herb J. Hawthorne, Inc., Houston, announces the company's management committee.

Davidson joined Hawthorne as a sales representative after serving 11 years with an oil-industry supply firm, where he had worked in division-management capacities. Davidson was advanced to assistant sales manager at Hawthorne last fall.

### Martin Wheeler joins Milwhite

. . . Mud Sales Co. as sales representative in the Oklahoma City area. Previously Wheeler was with Fox Rig & Lumber Co.

J&L Supply Division, Ohio Injector Co. officials reach agreement

. . . by which OIC valves will be sold through Jones & Laughlin Supply Division's offices and stores. Discussing future distribution plans are, left to right, W. L. Wolfe, J&L's vice president in charge of sales; Rainey Elliott, president of J&L; Roger E. Bremer, Ohio Injector Co.'s executive vice president; and G. R. Winder, OIC vice president in charge of marketing.

### James T. Workman is appointed

J. T. Workman

. . . administrative assistant to Andrew W. Rose, president of Byron Jackson Division of Borg-Warner Corp.

Workman, who has been with Byron Jackson since 1946, formerly was general superintendent of BJ pump and oil-field products. He had also been general manager of the company's PB rubber plant and served as administrative assistant to former BJ president, E. S. Dulin.

### Export packing company opens

John Herold and Monroe Ashworth announce the opening of Herold Export Packing Co. in conjunction with Herold Supply Co. New offices, warehouse, and export crating yard are located in Houston. Another yard and warehouse are located in the vicinity.

The crating yard is designed for special overseas preparation of oil-field material, equipment, and general cargo.

### R. J. Evans, Jr. is appointed

R. J. Evans, Jr.

. . . vice president and domestic sales manager of Byron Jackson Tools, Inc., according to Robert Harcus, executive vice president and general manager. Evans, associated with BJ oil-tools sales operations for more than 18 years, was southern regional sales manager before assuming the new position. He will headquarter in the Mid-Continent area.

### W. K. Masoner is appointed

. . . technical sales representative in Tulsa, announces G. W. Overstreet, Dallas district manager for Wolverine Tube Division of Calumet & Hecla, Inc.

Formerly associated with Fluor Products Division as design engineer of water-cooling towers and air-cooled heat exchangers, Masoner will concentrate his efforts on the application, engineering, and sales of Wolverine's finned-tube and condenser-tube products.

The new representative will headquarter in Tulsa and will cover Oklahoma, Arkansas, northern Texas, Louisiana, Mississippi, Alabama, and western Tennessee.

### James M. Bird is elected

. . . to the board of directors of Seismograph Service Corp., announces G. H. Westby, president of the seismic firm.

Bird was named vice president in charge of well-logging activities in January, following the purchase of Birdwell, Inc., by SSC. Birdwell now operates as a division of SSC.

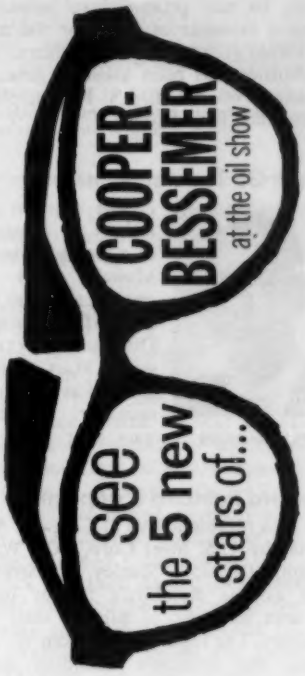
### Core reassigns Stan Dickerson

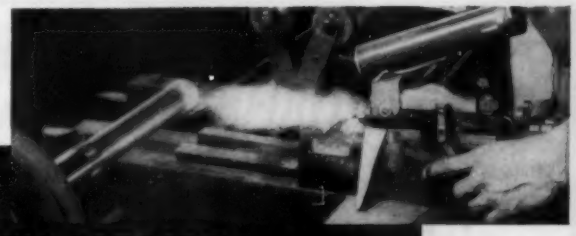
. . . to the Mid-Continent area as a sales engineer. He will headquarter in Oklahoma City. Previously he operated as a sales engineer from the San Antonio lab of Core's Corpus Christi, Tex., district. Dickerson is an 11-year veteran of Core Laboratories, Inc.

### John A. Houston is appointed

. . . general manager of Joseph T. Ryerson & Son, Inc.'s Dallas plant, announces Charles L. Hardy, president. Houston succeeds Fred W. Bush, who resigned to set up his own business as a manufacturer's agent.

Houston joined Ryerson in 1934

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and became a sales representative in 1940. After serving as assistant sales manager at the company's Chicago plant, he was promoted to assistant general manager of sales for the nation-wide group of Ryerson plants.

Houston has been assistant general manager of the firm's Philadelphia plant since last October.

## Grant Oil Tools announces

... the election of Robert E. Masters as a vice president. Masters, who is general manager of the MacClatchie Division, started with MacClatchie in 1954 as assistant manager. He became manager 3 years later.

## Howard Rainbird is appointed

... area representative at Calgary, Alberta, by U.S. Steel Corp.'s Oil Well Supply Division. Stanley D. Strand will assume Rainbird's former post as area manager of tubular sales in Calgary. The report comes from W. A. Weir, the division's Canadian area manager.

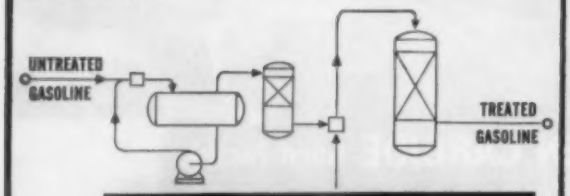
Rainbird started with Oilwell at Calgary 12 years ago. In 1949 he was transferred to Edmonton and was appointed field representative. He took over as city representative in 1957 and finally was transferred to Calgary as manager of tubular sales.

Strand was employed by the company 11 years ago at Edmonton. He was named store manager there in 1951 before being shifted to Calgary in 1956 as city representative. The next year he went to Toronto as area representative, the post he held until his present appointment.

**Mission Mfg. Co. holds annual sales meeting in Houston**

The session coincided with the formal opening of Mission's new Houston manufacturing facilities. Shown at one of the sales sessions are, front row, left to right: R. M. Wood, C. O. Bartley, R. E. White, T. R. Fullinwider, J. S. Stewart, Tony Volotko, and R. L. Booth. Second row, from left, are: John H. Brown, R. E. Hardy, E. D. Hallum, Neal B. Heaps, Paul Chisholm, Harold L. Herren, A. E. Higginbotham, O. K. Ryan, C. W. Fryar, and M. C. Davis. Third row, left to right, are: W. Y. Cadwallader, Harold L. Riley, Lloyd W. Bahr, John H. Bannister, F. S. Mims, F. J. Hebert, Keith C. Snyder, B. M. Wright, Don Greenlaw, A. E. Robinson, Norman Robertson, and M. V. Sparks. Last row, from left, are: E. L. Brown, G. B. Wyatt, Joe T. Weaver, K. A. Woodard, M. C. King, C. E. Van Loozen, W. C. Underwood, J. H. Bannister, Henry A. Lee, J. E. Young, Joe J. Scalise, and G. P. Gardere, Jr.


TC SWEETENING

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### F. M. Lehner is appointed

. . . West Coast area manager for Seismograph Service Corp., SSC's Birdwell Logging Division, and Seiscor Mfg. Co.

Lehner, formerly SSC's West Coast representative, will have supervision over the corporation's continuous-velocity logging crew, oil-well servicing offered by the newly acquired Birdwell Division, and manufacturing facilities of SSC's subsidiary, Seiscor Mfg. Co.

Before joining the company, Lehner was a seismologist in the geophysical department of Shell Oil Co.

### Hughes Tool Co. names Morlan

. . . to the position of assistant research director, announces Dr. Daniel J. Martin, vice president, engineering.

E. A. Morlan

Morlan, a member of the Hughes engineering and research organization since 1938, has 14 inventions upon which patents have been issued or are pending.

### General Electric Co. to combine

. . . its communication-products department in Lynchburg, Va., with its technical-products department of Syracuse, N. Y. The combined organization, which will headquarter in Lynchburg, will be headed by Harrison Van Aken, general manager of the communication-products department.

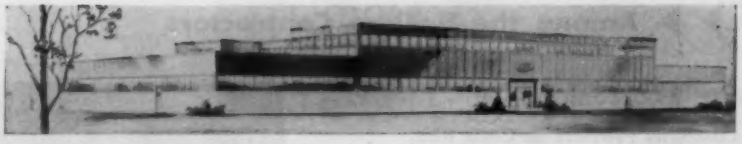
Two-way radio communications for the petroleum industry, previously manufactured at Utica, N. Y., will now be made at the new headquarters.

### W. I. Pell named sales manager

. . . of Kerotest Mfg. Co.'s Steel Products Division, announces E. N. Wrenshall, general manager of the Pittsburgh valve-manufacturing firm.

W. I. Pell

Pell formerly was manager of pipe sales for Colorado Fuel & Iron Corp. Prior to that he acted in the same capacity for Worth Steel Co. of Clayton, Del.



**NEW PLANT** of Hoke, Inc., is situated on a 13-acre tract in Cresskill, N. J. The 64,000 sq. ft. plant houses manufacturing, assembly, and testing departments; engineering and research labs.; and administrative and clerical offices. The site includes a 16,000 sq. ft. parking area.

### J. T. Carle is named manager

. . . of the new oil-well pump section of Byron Jackson Tools, Inc., according to Robert Harcus, executive vice president. Headquarters for the pump section was recently established at BJ's Tulsa plant.

J. T. Carle

### I. B. Allen to represent Rolo

. . . Mfg. Co. in Trinidad, B.I.W., Robert K. Franklin, Rolo president, announces. G. J. Streetly will assist the new representative.

### Walworth Co. completes

. . . negotiations with Midwest Piping Co., Inc., for the manufacture of Walworth welding fittings. The announcement comes from John Wallace, president of Walworth.

### Cummins Engine Co. promotes

. . . G. L. Bego and R. W. Franck to new positions, announces C. R. Boll, vice president in charge of sales.

Bego has been named director of sales services, where he will be responsible for directing all activities of the company's sales-development department and Cummins Diesel Sales Corp., a wholly owned company subsidiary. Bego, former manager of the subsidiary, joined Cummins in 1951.

Franck has been named field-sales manager and will be responsible for fleet-sales activities and regional offices. Franck, who joined the company 11 years ago, was manager of sales development before his recent appointment.

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## ▶ ▶ ▶ Among the Drilling Contractors

### Costa Rica contract let

Compania Petrolera de Costa Rica, Limitada, an exploration company combine headed by Union Oil Co. of California to explore for oil in Costa Rica, has awarded a comprehensive drilling contract to Drilling & Exploration Co., Inc., Dallas.

Under the contract, Drilexco will furnish supervision and technical assistance for the drilling of several wildcats in the Latin American republic.

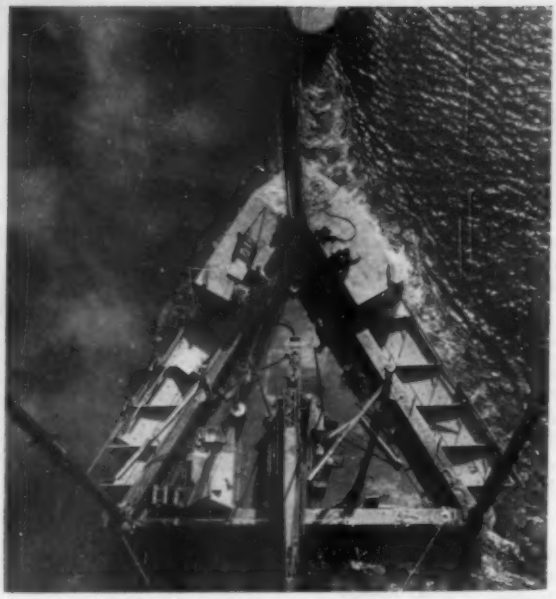
Drilexco shipped an Oilwell 96 rig from Houston for the venture April 1. It was scheduled for unloading at Puerto Limon about April 15.

Compania Petrolera de Costa Rica plans to spud in its first test, a deep one to about 15,000 ft., in early May only a few miles from Puerto Limon. The drill site is easily accessible by railroad and highway from the port city.

### Ace-Hi reshuffles

Ace-Hi Drilling Co., Tulsa, announced the following changes in officers of the company: Walter H. McKenzie, president; George W. Reed, vice president, and W. B. Berard, treasurer and assistant secretary.

The firm has entered its first foreign operations with four air-combination rigs. Two are in British Honduras and two are in Cuba. In addition to these four rigs, the company operates five air combinations and five water rigs domestically. Present operations include one rig in Colorado, one in Montana, one in Texas, two in California, three in Oklahoma, and two in Wyoming.



**UNIQUE FLOATING PLATFORM** is used by Long Point Oil & Gas, Ltd., in offshore Lake Erie. The drilling platform can drill in 25 ft. of water, and its floor will be 10 ft. above water level. For deeper water, up to 45 ft., the present rigs can be replaced with those of higher tensile strength. The legs are hydraulically operated, and the platform is designed to withstand winds up to 80 m.p.h. and wave action to 20 m.p.h. Electrically heated living quarters are provided for a crew of six, in a bunkhouse with adjacent hot and cold showers, kitchen, and messroom. This is the first floating platform designed for offshore cable-tool drilling.

**Inland Drilling Co.** has contract for a 6,600-ft. "J" Dakota Cretaceous wildcat 3½ miles northwest of Colorado's Empire field. The well is William Angle et al. 1 McArthur-Progress Royalty Co. in C NW NW 33-4n-61w, Weld County.

**Anschutz Drilling Co.** has contract for a 7,700-ft. Morrison test at Lonetree Creek in Weston County, Powder River basin, northeastern Wyoming. The well is Farmers Union Central Exchange 2 Sapphire-Johnson, SE SE 28-45n-67w. Objective is the Jurassic.

**Pyburn Drilling Co.** of Shreveport has taken on contract to deepen to about 9,900 ft. at The California Co. 1 Nobles Unit B-27, 12-19n-4w, on the south flank of Hico-Knowles field in Lincoln Parish, northern Louisiana. Original depth of the hole was 8,824 ft. where it was a Bodcaw gasser in 1948. New depth will go to Taylor sand of the Cotton Valley.

**McDaniel Drilling Co.** will be contractor on a wildcat hole in Banner County, western Nebraska. The Denver basin test is Colorado Southern Petroleum Co. 1 Johnson, C SE SW 9-19n-56w. Objective is the Dakota Cretaceous sands.

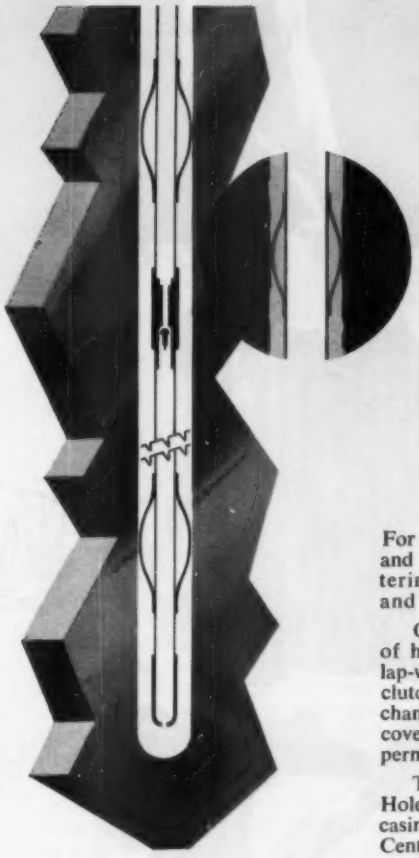
**Don Rounds** has contract for Chandler & Simpson 1 Rodman "N," C NW NE 19-15n-54w, Kimball County, Nebraska. This Denver basin wildcat will go to the Cretaceous Datota sands.

**Sauvage Drilling Co.** will be contractor on a granite wash test to 4,625 ft. in Lincoln County, far from production in western Nebraska. The well is William Wade 1 Melton, C SE SW 9-9n-33w. It is a tight hole. Location is on the flanks of the Chadron-Cambridge arch.

**Rogers Drilling Co.** has contract for a wildcat in Logan County, Colorado. The Denver basin Skull Creek test is the S. D. Johnson 1 Nicklas, C SW SW 30-9n-55w. Depth objective for the Cretaceous test is 5,750 ft.

**Exeter Drilling Co.** will be contractor on a 6,500-ft. "J" Dakota Cretaceous sand test in Morgan County, Colorado. The Denver basin well is Falcon-Seaboard Drilling Co. 1 Campbell in SE NW 15-6n-59w. Also in the Denver basin, **Brinkerhoff Drilling Co.** has contract for a wildcat in Washington County. The well is Dawson Oil-Ancora Corp. 1627-1 Downing in C NE NW 27-1s-56w. The well will go to 5,200 ft. or the "J" sand.

**Carl B. King Drilling Co.,** Midland, has contract for Humble Oil & Refining Co. 1 Bandana Point Unit, in 13-23s-23e, southwestern Eddy County, New Mexico. This rank wildcat is outside of the presently charted limits of Delaware basin. Location is 16 miles due west of Dark Canyon field, and about 20 miles southwest of Carlsbad. Contract depth is 12,000 ft.



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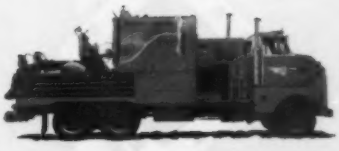

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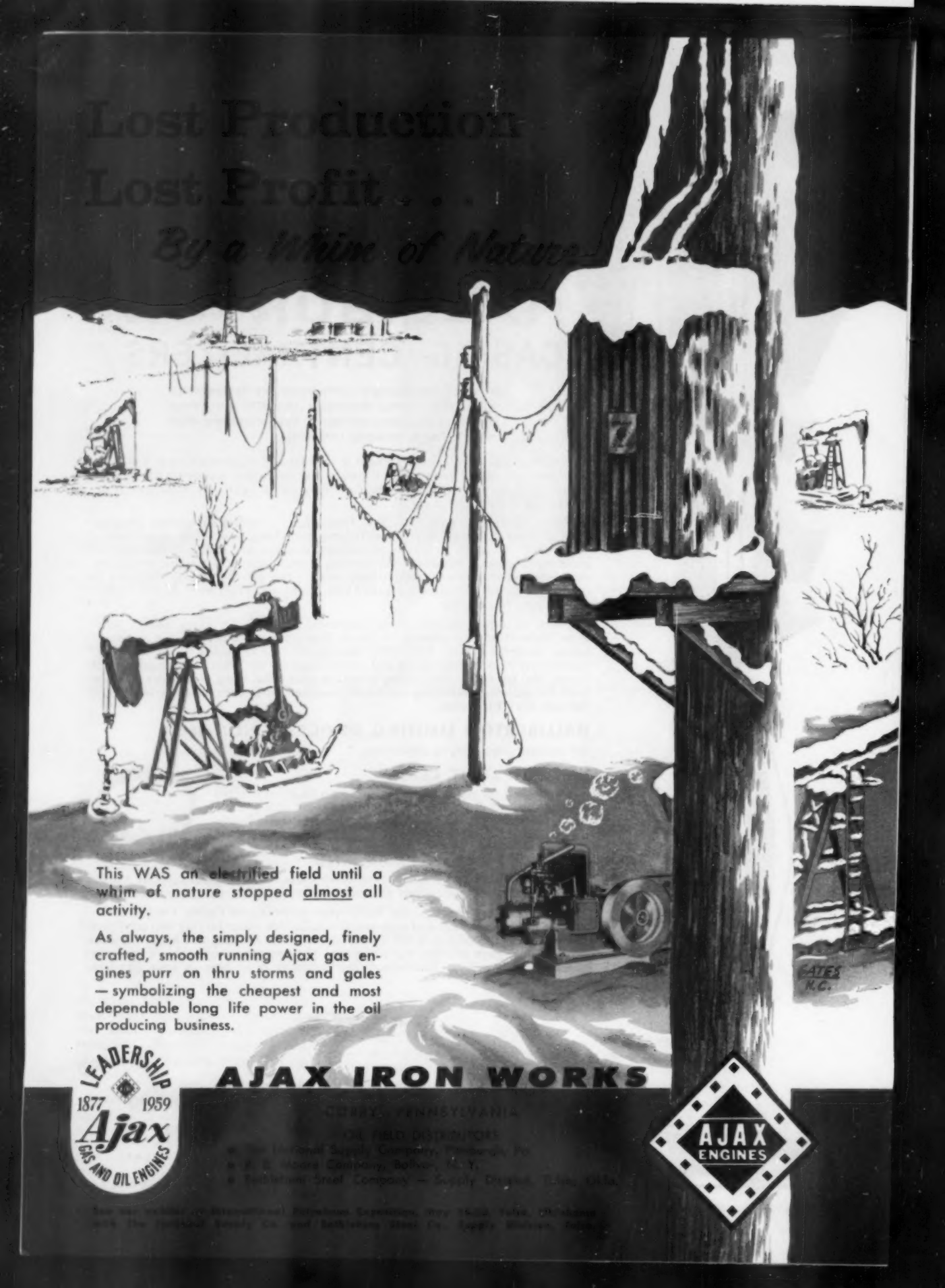
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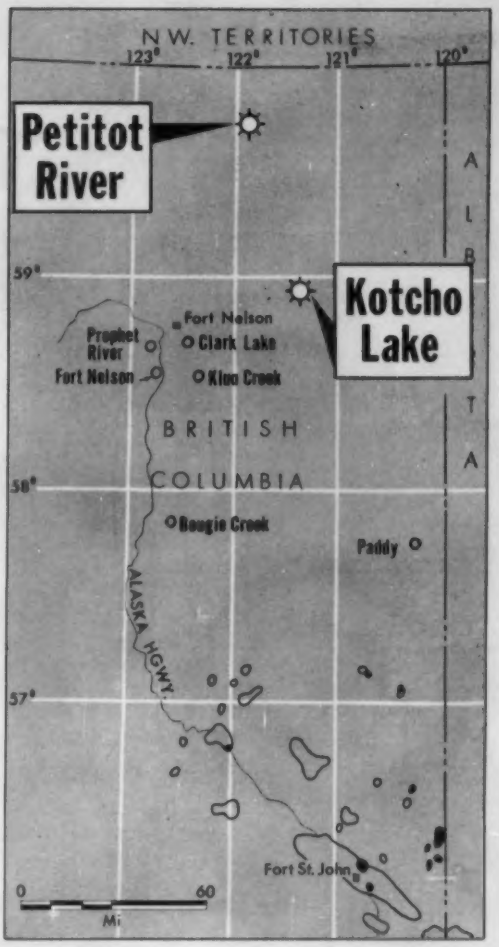
# Two big gassers reward northern oil hunters

BY FRANK J. GARDNER

IN WORDS SO MODEST that they were almost apologetic, a couple of two-paragraph press releases last week announced the two most important discoveries in western Canada since Swan Hills in 1957. They came from Western Natural Gas Co., of Houston, parent company of the discoverer, Gulf States Oil Co. of Canada.

These two strikes, in two giant strides, plant the oil and gas industry firmly on the doorstep of the Northwest Territories.




**SIMULTANEOUS** discoveries of big gas at Petitot River and Kotcho Lake wildcats in northeastern British Columbia have emerged as the most important in Canada since Swan Hills. Both produce from Middle Devonian-Slave Point dolomite, correlative to the Swan Hills reservoir.

**Twin payoffs . . .** The two discoveries lie northeast of Fort Nelson in the northeastern corner of British Columbia; one is 50 miles from the nearest previous gas production, the other 70. Both are producing from Middle Devonian-Slave Point formation at the 6,600-6,700-ft. level. This is the age of the reef reservoirs in the Swan Hills oil region of West Central Alberta.

Earlier discoveries in northeastern B.C. have found Slave Point gas at Clark Lake, Klua Creek, Paddy, and Prophet River fields (see map). Bougie Creek and Fort Nelson fields, also in this region, are Mississippian-Rundle producers.

**On two big blocks . . .** The northernmost of the two new finds, Gulf States 1 Petitot River, lies only 15 miles south of the border of the Northwest Territories (Unit 34, Zone D, NTS map 94-P-13). Here, Gulf States gaged a flow of 6,408 M.c.f. per day on a ⅜-in. choke, with flowing pressure 2,214 psi. It is on Natural Gas Permit 382, a 101,244-acre block lying 70 miles northeast of Fort Nelson. Operator carried the hole to 6,582 ft. Officials of Fargo Oils, Ltd., a 50% participant in the discovery, have estimated an open-flow potential of 150 M.M.c.f.d. for the well.

The second discovery, Gulf States 3 Kotcho Lake, is 60 miles southeast of the first, and 50 miles eastnortheast of Fort Nelson (Unit 67, Zone K, NTS map 94-I-14). The completion here was for 5,350 M.c.f. per day on a 20/64-in. choke, with flowing pressure of 2,156 psi. It lies on Natural Gas Permit 311, a 176,729-acre block. Concerning Kotcho Lake, Fargo had this to say: "The absolute open flow of this well can be classified as that of one of the larger wells in North America, and could exceed that of the recently discovered Berland River well." Those guarded words are highly significant, in view of the fact that Berland River just happens to be the biggest gasser ever completed in Canada, and possibly in the world; it poured out 1½ billion cubic feet per day (AOF). Fargo has no interest in the Kotcho Lake discovery, but does have large interests in permit acreage near it.

**Justify a search . . .** If these are reef hits, and if they're the big-potential strikes they're rumored to be, then we cannot overemphasize their importance. This is the first successful climax to the big northward push that began in Canada a couple of years ago. At that time, leasing fires swept from Fort St. John clear up to the Arctic Ocean. More recently, large blocks of acreage have been taken in northern and western B.C.

**And call for a pipeline . . .** The stimulating factor to exploration of these northern lands will of course be a pipeline outlet to the south. For Petitot and Kotcho it may come sooner than we think, for already, Westcoast Transmission Co., Ltd., is said to be eying the shut-in reserves along the Alaska Highway and beyond; this company now gathers and processes the gas in the Fort St. John area, and should sufficient new gas reserves develop around Fort Nelson, a long northward extension of its lines is definitely in the cards.

British Columbia is truly a "giant of the future" (OGJ, Aug. 18, 1958). Such discoveries as these only underscore the point.

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# Salt domes of East Texas basin

## —they're flavored with oil

THE PRESENCE of salt domes in the East Texas basin has been known for many years. Before the arrival of the white man, Indians are reported to have visited the salt licks which overlie some of them.

Salt was commercially produced at Grand Saline salt dome as early as 1845, and during the Civil War, evaporation of the salt water from wells at several East Texas domes took place on an extensive scale. Production of salt at Grand Saline amounted to 100 tons a day.

At Steen dome a reported 3,000 people were engaged in making salt during the Civil War, and the output was 120 tons daily, with 20 furnaces making a bushel of salt from every 190 gal. of water. Limestone was quarried on Steen right after the war. The lime was burned in kilns and used in mortar for construction in Tyler, Tex.

Sulfur is practically unknown in the interior domes. They did not assume importance as oil producers until 1927 when oil was discovered on the Boggy Creek salt dome.

These domes lie generally along the axis of the East Texas geosyncline, which is principally Mesozoic in age. Wells on the west and north sides of the basin near Dallas and Red River have penetrated Pennsylvanian sediments beneath the Cretaceous. The deepest wells near the axis of the geosyncline have penetrated the Jurassic-Smackover formation and salt of questionable age without going completely through the formation. The Lower Cretaceous consists of about 8,000 ft. of shales and limestone. The Upper Cretaceous is about 4,000 ft. thick and consists principally of shales and sands. All sediments thin towards the edge of the geosyncline.

The interior domes are separated from the coastal domes by a broad belt of country coinciding with the outcrop of the Oligocene sediments. The domes are confined to the outcrops of the Wilcox and Claiborne groups, both of Eocene age.

There are 17 known piercement domes in East Texas and at least 10 established deep-seated domes. Van, Quitman, and Hawkins would fall in the classification of the deep-seated domes. Most of the known deep-seated domes are productive of oil or gas. The piercement domes have recently assumed importance as oil producers or potential oil producers and the balance of this paper will deal with these.

**INDEX MAP** of East Texas piercement salt domes. The 17 above are known and at least 10 more established deep-seated domes exist in this area. Structural contours shown are on base of Massive Anhydrite. Note indicated fault patterns. (Fig. 1).


**BY H. H. KRUSEKOPF, JR.**
Price & Krusekopf, Tyler, Tex.


### Hainesville Revives Interest

The discovery of oil on the Hainesville salt dome by British American Oil Producing Co. in July 1956, stimulated a lease boom in the East Texas area greater than anything the area had seen in a number of years. Actually, The Texas Co. had established production on Bethel dome about 3 weeks earlier, but the turn of events gave the Hainesville discovery more notoriety.

The finding of oil on an interior salt dome gave East Texas some new objectives. Salt-dome exploration there, with isolated exceptions, had been dormant for about a quarter of a century.

When oil was discovered on the Boggy Creek dome in 1927, only six other interior salt domes were known. These were Grand Saline in Van Zandt County, Steen and Brooks in Smith County, Keechi and Palestine in Anderson County, and Butler in Freestone County. The Boggy Creek discovery stimulated surface and geophysical exploration in this area, and resulted in the discovery of 10 additional domes during the next 4 years. No new salt-dome discoveries were made in the East Texas basin following this until 1942 when Magnolia Petroleum Co. found oil on Concord dome in Anderson County.

The period from 1927 to 1932 was one of active exploration on the interior salt domes. This activity brought no new discoveries of oil in the early thirties after Boggy Creek. As a result, exploration of domes became semidormant and except for occasional bits of activity, this type of search remained quiet until 1953.

In the latter part of 1953, Fort Bend Oil Co. drilled through a salt overhang on the Bethel dome in Anderson County. Previously at least two other salt overhangs had been penetrated on piercement domes, but none had been drilled since the late 1920's. In 1954, D. D. Feldman encountered cap rock on a piercement dome and

drilled deeper into sedimentary beds on the Mount Sylvan dome in Smith County.

These two wells were enough to stimulate the thinking of some companies to reevaluate the potential of piercement domes in East Texas. In 1956, the discovery of oil by British American in Wood County and by The Texas Co. in Anderson County below salt overhangs brought a reawakening.

At present all of the known piercement salt domes in East Texas are largely under lease. Renewed geophysical activity and geological study to date has added Oakwood dome to the list of producers along with Boggy Creek, Hainesville, and Bethel. Texaco was instrumental in bringing Oakwood into production last year.

Boggy Creek and Concord domes are well described in the literature. Bethel is new, but now has enough wells that at least a partial picture can be pieced together.

### Bethel Dome

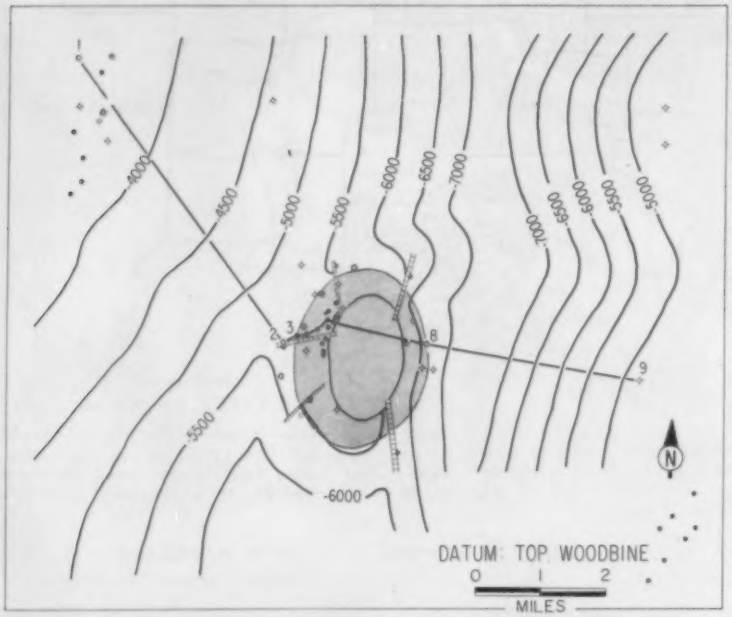
Bethel dome lies in northwestern Anderson County. It is on the west side of a deep Upper Cretaceous syncline, about midway between Tennessee Colony and Cayuga fields. Wilcox and Carrizo surface outcrops cover the area surrounding the dome. No pronounced domal surface expression is apparent, though there is indication of a graben over the dome.

Gravity work indicates a well-defined salt-dome-type minimum with a minimum trend to the north and south which has been interpreted by some as a deep salt ridge. Meager subsurface control will not substantiate this ridge theory and shows the dome to be located on the flank of a deep syncline.

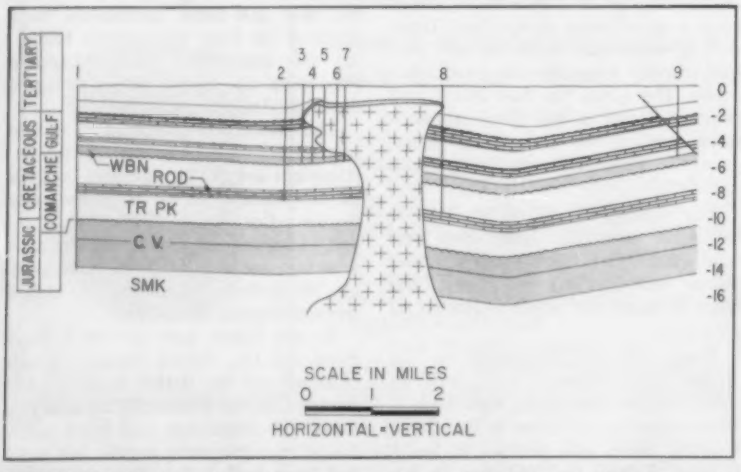
The west rim of this syncline is formed by the Cayuga structure and the east rim by the Tennessee Colony-Blackfoot trend. These anticlines are well-defined structural ridges. Isopachous mapping indicates these anticlinal trends to have been positive areas during Upper Cretaceous time and the Bethel syncline to have been a negative area during the same time. The Lower Cretaceous shows a diverse pattern to the Upper Cretaceous formations as compared to the same formations at Tennessee Colony and Cayuga. This indicates that the Bethel dome area was positive during Lower Cretaceous time. Subsurface control is so sparse that it is possible for the Bethel area to be construed as a part of an elongated structural ridge in Lower Cretaceous time.

All formations appear to lie fairly flat beneath the overhang except immediately adjacent to the salt stock, where the beds dip away rather steeply. A rim syncline partially encircles the dome, especially on the west or regionally updip side. The rim syncline is less evident on the east flank, or regional downdip side.

Well No. 8 on the map and cross-section, the McBee 1 Cone, is about 1,700 ft. structurally lower than the wells on the west side of the dome; this would indicate a steepening of dip into the syncline, or more probably



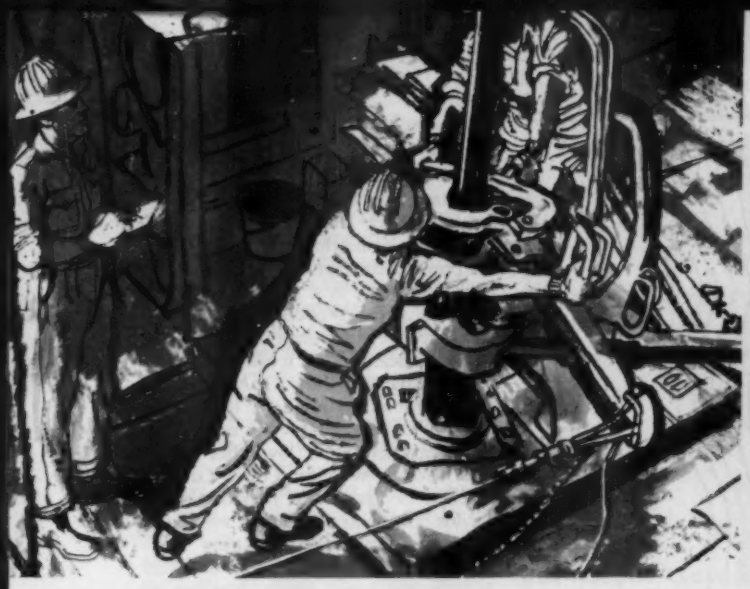

**REGIONAL MAP** showing structure contours across the Bethel dome. Line through wells No. 1 to 9 is shown in the cross-section below. (Fig. 2).




**CROSS-SECTION** from line above across the Bethel dome, Anderson County, Texas. Formation symbols shown in ascending order are: Smackover, Cotton Valley, Travis Peak, Rodessa, and Woodbine. (Fig. 3).

## About the author . . .

The author was geologist for Magnolia Petroleum Co. in Roswell, N. M., and Tyler, Tex., from 1948-54. He was district geologist with Pubco Petroleum Corp., 1954-57, in Roswell. Since then he has been a partner in the firm of Price & Krusekopf, consulting geologists in Tyler. Much of his experience has been with East Texas problems and salt-dome studies are of special interest to him. Krusekopf received his B.S. degree from University of Missouri and a master's degree in geology from University of Michigan.



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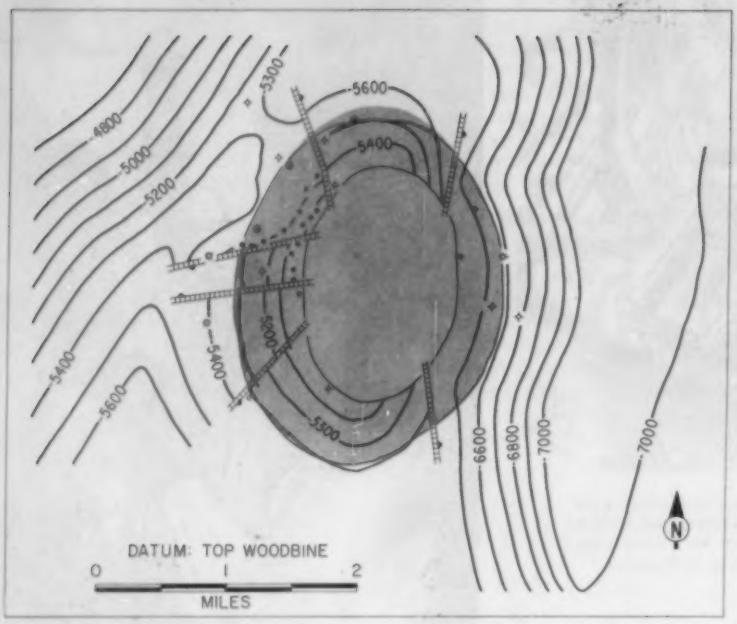
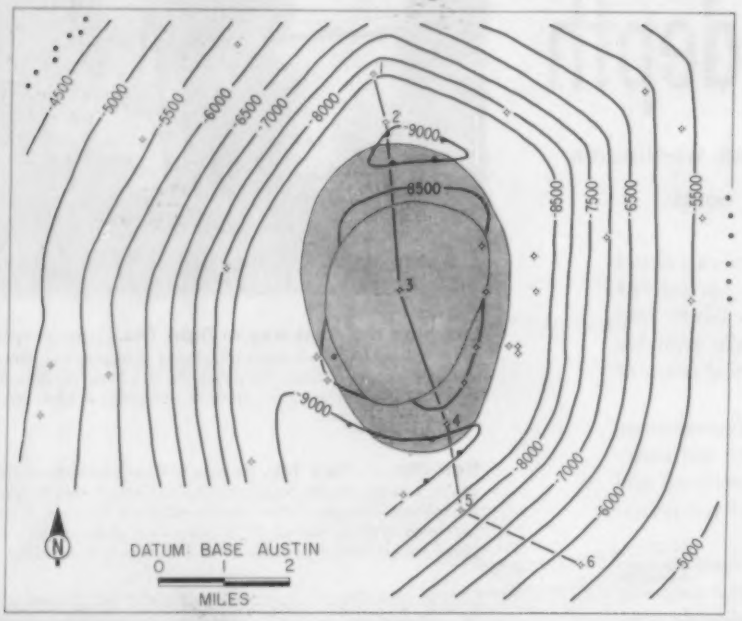



**DETAILED** structure map of Bethel salt dome. (Fig. 4).




**STRUCTURE CONTOURS** on base of Austin on the Hainesville salt dome, Wood County, Texas. (Fig. 5).

one or more down-to-the-basin faults. Whether or not this fault or faults are regional and extend further north and south is unknown. If the faulting was present in the early development of the basin, it might have been a zone of weakness in which the salt dome pierced a short distance away from the axis of the syncline.

The west side of the dome is interesting because of the flattening of dip in wells Nos. 2 through 7. Part of this flattening might be due to small faulting that undoubtedly is present; this is considered of no importance to accumulation and hence is not shown. The fault on the northwest part of the dome and the northernmost of the graben faults are controlled and probably did influence the accumulation, as evidenced by the dry holes on the downthrown side.

**Overhang . . .** The cross-section shows an interesting feature of an uneven overhang, somewhat different from the popular conception of a salt dome. Also noticeable is a small amount of thinning of the Woodbine and Lower Cretaceous formations around the dome, indicating that it was a positive area during that time. Growth of the dome probably started at the beginning of Lower Cretaceous or earlier, and remained as a low-relief structure through Woodbine time. Growth reached a quiescent period during Taylor and Navarro time, while the basin was sinking, and during Midway and Claiborne time the salt growth was again active, piercing to near its present position. The salt came to about 1,500 ft. from the surface and spread out into a mushroom cap over 2 miles wide. The overhang on the west flank is about 4,000 ft. wide, while on the east the amount of overhang is unknown.

**Multiple pay zones . . .** Texaco has now completed 15 Woodbine oil wells and 6 Rodessa gas wells on the west side of the dome.

There are three potential Woodbine sands that are capable of producing.

The upper two sands are 10-12 ft. thick and the lower sand is about 25-40 ft. thick. Each sand will have a slightly different water table, but no Woodbine production has been found to date below a —5,350-ft. datum.

The Rodessa pay will average about 50 ft. of net porosity. No water has been found in any of the wells so far. A Pettit zone of about 20 ft. net porosity has not yet been produced.

McBee has a Rodessa gas well on the east side of the dome which has now been completed. This well has a net 59 ft. of porosity in the Rodessa. The Woodbine does not appear productive, though the zone was not tested. It is possible for the Woodbine to be productive closer to the dome, though the well just west of the McBee well which is presently drilling had no oil shows in the Woodbine.

### Hainesville Dome

The Hainesville dome is located in south central Wood County, near the center of the deep Upper Cretaceous-Hainesville basin. The surface expression of the dome is a type locality for a sink overlying the dome. Weches and Queen City cap the rim around the basin. Sparta sand covers the surface. A graben with faulting and about 300 ft. of displacement caps the dome.

The topographic expression shows over 100 ft. of relief between the sink and the rim.

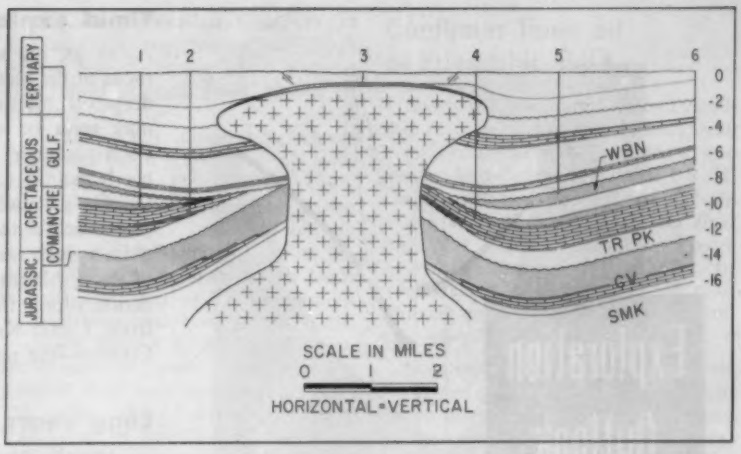
Gravity shows a well-defined salt-dome-type minimum. The dome lies in the deepest syncline in East Texas, and is probably the largest salt dome in East Texas. The rim of the Hainesville syncline consists of anticlinal trends: the Quitman-Manziel trend on the northwest, Van on the southwest, Hawkins on the southeast, and the Kelsey structure on the east. It is probable that early salt movement out of the basin toward some of these higher areas took place before the rupture and subsequent piercement of the dome in the center of the basin. Steep dips of Upper Cretaceous sediments into the basin, and a rim syncline on all sides are quite noticeable.

The Hainesville cross-section shows a sharp angular unconformity between the Eagle Ford and pre-Eagle Ford formations. The British American 1 Weisenhunt (on SW flank) went from Eagle Ford shales into Cotton Valley sand, truncating the entire Lower Cretaceous section. The B-A 1 Judge (well No. 4), and the Trice wells (Nos. 1 and 2) show pronounced thinning of Lower Cretaceous sediments and indicate progressive truncation toward the salt core; this opens up the possibility of numerous stratigraphic traps.

The Lower Cretaceous structure was a broad dome possibly 5 miles in diameter. This breadth causes the rim syncline surrounding the Lower Cretaceous dome to be much farther out than the rim syncline of the Upper Cretaceous. All formations appear to have been affected and turned up some by the salt movement. Well control for the Lower Cretaceous is very limited in the Hainesville basin, but it is entirely possible that the Hainesville dome is located on a Lower Cretaceous structural ridge.

The Eagle Ford and Austin show a slight thinning around the dome but thicken into the rim syncline. All formations above the Austin show a great thickening into the basin, indicating little if any piercement growth before Wilcox time.

The dome started to grow in early Comanchean time or before, and stood as a large positive element during Lower Cretaceous and Woodbine time. It was probably similar to a deep-seated dome. Erosion stripped away much of the Lower Cretaceous sediments and left a relatively flat surface for deposition of the Eagle Ford and Austin. The syncline was sinking rapidly during Taylor and Navarro time, with little if any sporadic salt growth. It was during Wilcox and Claiborne time that rupture and rapid growth of the piercement salt took place. The salt came within 1,000 ft. of the surface. Subsequent solution by ground water and slumping probably accounts for the graben overlying the dome.




**NORTH-SOUTH CROSS-SECTION** across the Hainesville salt dome. Formation symbols shown in ascending order are: Smackover, Cotton Valley, Travis Peak, and Woodbine. (Fig. 6).

The B-A 1 Weisenhunt is still the only producing well at Hainesville. It was completed in probable Cotton Valley sand and is now pumping about 30 bbl. per day. Development has been slow due principally to the depth and cost of the wells.

### Prospects Are Bright

Most of the interior domes have had no systematic exploration. There are other domes in East Texas that appear just as prospective as the presently producing domes and with time, patience, and continued exploratory programs other domes are certain to be brought into production.


### Acknowledgment

The writer thanks Walter Fitzgerald and G. C. Clark for their help in preparation of the illustrations.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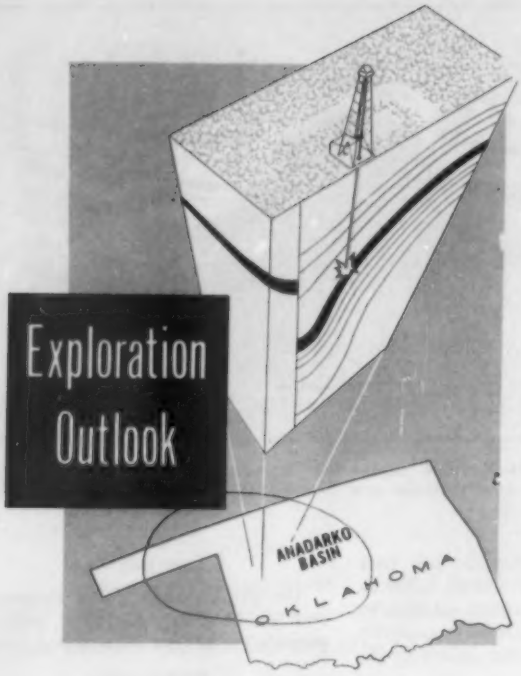
# University of Texas begins TV classes

The University of Texas geology department will initiate closed-circuit television instruction in its introductory geology courses next September on an $8,560 grant from the Minnie Stevens Piper Foundation of San Antonio.

The grant will enable the geology department to produce 20 video-tape lessons, Dr. Samuel P. Ellison, geology department chairman, said. Each will be 30 minutes in length.

Dr. William R. Muehlberger, geology associate professor who already has appeared in several special University television films, will be featured professor in the series. He and Robert F. Schenkkan, Radio-Television director, will produce the 20 programs for use on the University's closed-circuit television system. The video-tape series will be put on kinescope film and made available to other Texas schools and colleges.

The 20 television films will trace the history of the earth and its life, especially as recorded in rocks. Individual tapes will cover such topics as rocks and minerals, volcanoes, earthquakes, sedimentary-rock processing, weathering of soils caused by wind, water, and glaciers, mountain-making and rock deformation. The series also will present basic geologic evidence that will aid the student in gaining a concept of the thousands of centuries involved in each period of geological time, Dr. Ellison said.




## What's at the bottom?

A DUSTY OLD QUESTION—what lies at the bottom of Oklahoma's vast Anadarko basin?—appears closer to an answer. Magnolia Petroleum Co. gave Oklahoma its most important discovery since Carter-Knox field added 16,000-ft. Ordovician production 5 years ago at 1 Miller in Custer County. Prolific Siluro-Devonian Hunton lime gas production below 14,000 ft. definitely stamps the trough of the basin as a bright goal for future western Oklahoma exploration.

### Anadarko's second deep chapter

. . . unfolds as basin geologists ponder the worth of Magnolia's big find in Custer County. The well made 95 M.M.c.f.d. of gas from two sections: the Bois d'Arc at 14,383-14,472 ft. and the Chimney Hill at 14,773-14,818 ft. Custer County's first producer not only was a big gasser, but it:

- Tapped the second Hunton-lime producing area in the entire basinal area of the Anadarko. Just a few weeks before Magnolia's find, Sinclair Oil & Gas Co. opened similar production at a shallower wildcat in Major County, the 1 Spafford, discovery well of West Campbell field.
- Opened Oklahoma's second-deepest producing area. Deepest is Carter-Knox at the far southeast corner of the Anadarko basin.
- Found Siluro-Devonian production deeper than in any other field on the continent except one—Bell Lake in Southeast New Mexico.

### Timid exploration will grow bold

. . . as an intensified march down into the deeper rocks of the basin gets under way. Years of sporadic deep oil hunting in Anadarko's unknown depths may soon be swamped by a wave of "below the Pennsylvanian" wildcats. Anadarko's first deep chapter began at Carter-Knox, was footnoted at Shell Oil Co.'s Rumberger wildcat at Elk City last year (the world's second-deepest hole), and with Magnolia's deep success in Custer a whole new trend of deep thinking will unfurl. We will see plenty of action along the trough of Anadarko all the way from Carter-Knox northwestward to Roger Mills County—the one remaining dry county in the basin.

### Long years of predicting

. . . that Wyoming's Green River basin would join the gas giants appear nearing an end. Green River's gas day is here, although it is too early to tally the basin's real worth.

This three-in-one basin has long been a target for the gas and oil hunter, but it wasn't until 1958 that Rocky Mountain explorers really took a long look at its potential. The Desert Springs discovery in Sweetwater County provided the shove that placed the basin in this year's exploratory race. Seven new gas fields and one new oil pool plus two dozen field-well completions—that's the first-quarter score. These new discoveries are almost dwarfed, however, by the growing list of units being formed and drilled throughout the basin. Spring drilling is in full swing in the busiest basin in the Rockies.

Green River activity is not centered in any one area. It is scattered in every corner of the Red Desert-Green River-Washakie region. Places that bear scrutiny are the Rock Springs uplift, the area south of La Barge in Lincoln County, and southeast of Desert Springs. All will see action. All will see success. Desert Springs alone should emerge as a major gas reservoir for the basin that many have likened unto San Juan. The only difference is that San Juan **has** its gas, but Green River is **finding** its gas fast.

### North Dakota interest flares

. . . as Burke County becomes Williston's bristling center of development. So far this year half a dozen oil strikes and some 20 field-well completions plus more than 30 active operations make this border county a Mississippian hot spot. The big play is centered around the Rival-Lignite area, but we can expect important fill-in work throughout this northern Burke County area this year. But look for new fields to crop up in Burke, Divide, Renville, and Bottineau counties. Just a few years ago there weren't any producers here. North Dakota wildcatters looked longingly across the border at the seemingly unending parade of Mississippian discoveries in southeastern Saskatchewan. Now it appears that the long-expected spillover into North Dakota is under way with gusto.

*—John C. McCaslin.*

## Trouble hits Halbouty tests

A RUNDOWN on active Alaskan projects showed:

... **Kenai Peninsula.** Standard Oil Co. of California was redrilling at 7,624 ft. on 4 Swanson River unit after plugging back from 12,582 ft. Halbouty Alaska Oil Co. was fishing stuck drill pipe in the 10,695-ft. 1 Halasko-King Oil Co. Union Oil Co. of California was building a road to a drill site 5½ miles south of Kenai River on the beach.

... **Iniskin Bay.** Alaska Consolidated Oil Co. was drilling ahead below 6,000 ft. on 1 Antonio Zappa on the Alaskan Peninsula side of Cook Inlet.

... **Cape Fairweather.** Colorado Oil & Gas Corp. was testing two zones behind 9⅝-in. casing of 3 Yakutat after plugging back from 10,848 ft. to 7,564 ft.

... **Bristol Bay.** General Petroleum Corp. was hauling a drilling rig from the Bear Creek Unit on the Cook Inlet 65 miles across mountain passes and frozen tundra to a drill site on the west end of Becharof Lake on the Alaskan Peninsula. Two barge loads of drill pipe, fuel, and other supplies were enroute from Long Beach, Calif.

... **Icy Bay.** A Richfield Oil Corp. reconnaissance crew was studying possible drill sites around Yakataga, 250 miles south of Anchorage, for a wildcat to be spudded in this summer. The general area to be drilled lies about 75 miles east of the old abandoned Katalla field.

## Confirmer flows oil at Friendship field

Southern Cass County's new Friendship field, opened in March, has gained a confirmation well. Sam Sklar and Sunray Mid-Continent Oil Co. 1 R. H. Lemmon flowed 260 bbl. of 43° oil a day through ¼-in. choke on final test. Pay perforations in the Lower Anhydrite Stringer at 6,124-34 ft. were treated with 5,000 gal. of acid. Flowing pressure on tubing was 300 psi.; gas-oil ratio was 422:1.

Location of the new pool is 3 miles northwest of Lodi, in the Arthur Robertson Survey, A-888. It was opened by the same operator's 1 O. W. Lemmon with a flow of 190 bbl. a day through 20/64-in. choke, from perforations at 6,162-72 ft.

## New-pay discoveries dot list of Texas field openers

FIRST QUARTER 1959 saw 26 oil and 2 gas-pool openers completed in North Texas, (Texas Railroad Commission District 9), according to the commission's figures. These include new-pay discoveries in some cases.

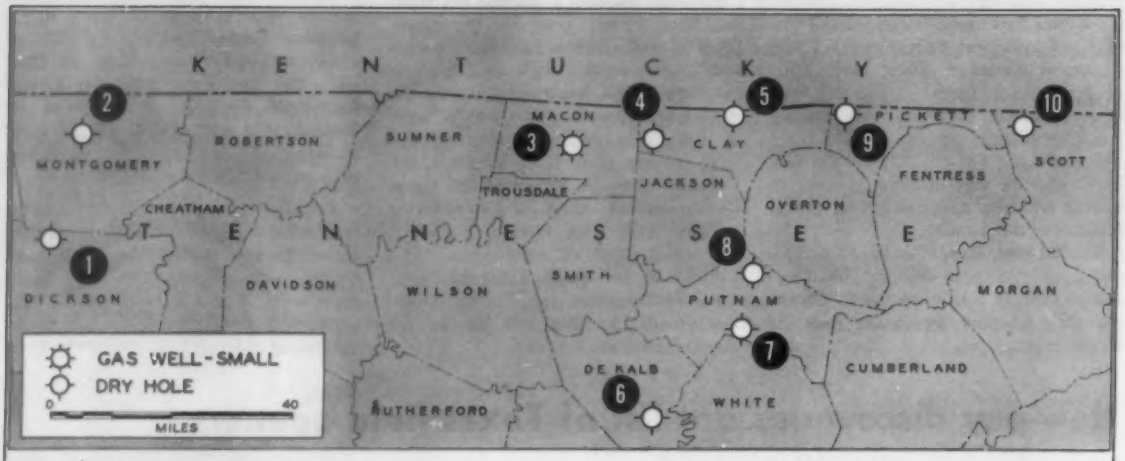
Shell Oil Co. 1 Conley, opener of Conley-Mississippian field in Hardeman County, was judged the most significant find. This well may prove to be on the southeast end of Palo Dura basin.

Standard Oil Co. of Texas' big gas well near Pottsboro in Grayson County was credited with starting another lease play in that county. The well made a heavy gas flow through small choke from Oil Creek sand pay, and was rated at 78 M.M.c.f.d. of gas, open flow.

Drilling has picked up in this district, after the usual year-end slump. In the first 3 months of 1959 there were 201 wildcat and 904 field locations staked, for a total of 1,105, compared with a total of 1,126 for the last 3 months of 1958.

New-field discoveries approved by the Railroad Commission during the first 3 months of 1959 are:

| New field— | Discovery well | Pay top (ft.) | Initial potential BOPD | Gravity (degrees) |
|---|---|---|---|---|
| Archer County: | | | | |
| Punk (Ellenburger) | Graridge Corp. 2 Mahler Dearing | 5,386 | 239 | 40 |
| Willy-Dunc (Caddo) | Taubert & Steed 1 Petrex | 5,224 | 156 | 41 |
| Clay County: | | | | |
| Joy, NE (4,600-ft. Strawn) | Ellis Jarmon 2 Peden | 4,588 | 136 | 45 |
| Cooke County: | | | | |
| Prince (3,250-ft. Strawn) | Virgil Taylor, Pace Bros. 1-A Nall Unit 2 | 3,252 | 177 | 38 |
| Thrasher (2,850-ft. sand) | Star Oil Co. 1 Thrasher | 2,848 | 134 | 41 |
| Walnut Bend (1,500-ft.) | Sinclair 49-UT Cox | 1,530 | 14 | 35 |
| Walnut Bend (2,150-ft.) | Sinclair 49-LT Cox | 2,168 | 70 | 38 |
| Wilson (2,600-ft.) | Kerr-McGee 3 Herrmann | 2,637 | 49 | 33 |
| Grayson County: | | | | |
| Big Mineral, SE (East FB-V sand) | Shell Oil Co. 1 Sweeney | 8,214 | 191 | 35 |
| New-Mag (Oil Creek) | Standard Oil Co. of Texas 3 McAdams | 12,813 | 78 M.M.c.f.d. | (gas) |
| Hardeman County: | | | | |
| Conley (Miss.) | Shell Oil 1 Conley | 7,790 | 226 | 48 |
| Jack County: | | | | |
| Catlin (Atoka) | Midland Oil Corp. 1 Coffman | 5,948 | 212 | 40 |
| Knox County: | | | | |
| A. P. C. (Tannehill) | American Petrofina 1 Davis | 2,324 | 67 | 35 |
| Buckstack (Tannehill) | W. M. Null 1 Harlan | 1,864 | 61 | 36 |
| Montague County: | | | | |
| Bowers (Penn.) | Bennett Oil Corp. 1 Reed | 3,894 | 209 | 39 |
| Haralmar (4,600-ft. Strawn) | Marshall Pipe & Supply Co. 1 Gilbert | 4,630 | 50 | 39 |
| Wise County: | | | | |
| Barrow (Caddo) | Chester Upham 1 McCurdy | 5,216 | 146 | 41 |
| Elrod (Strawn) | McCommons Oil Co. 1 Harrison | 4,578 | 211 | 41 |
| Meandor, South (conglomerate) | Kingwood Oil Co. 2 Morris "C" | 5,619 | 226 | 42 |
| Nall, SE (Strawn) | Lone Star Producing Co. 1-UT Murphy | 3,250 | 16 | 41 |
| Paradise (5,200-ft. Atoka) | Christie, Mitchell & Mitchell 1 Gilliland | 5,268 | 156 | 43 |
| Risch, East (Atoka) | Texaco 1 Denison | 5,084 | 150 | 43 |
| Snow (5,200-ft.) | Lone Star Producing Co. 1 Meeks | 5,246 | 45 | 49 |
| Thetford (Atoka) | Christie, Mitchell & Mitchell 1-C Thetford | 5,068 | 154 | 42 |
| Young County: | | | | |
| Alco, West (Miss. Gas) | Russell Maguire 3 Steele-Allar | 4,426 | 25,350 M.c.f. | (gas) |
| Stray (Conglomerate) | Artex Oil Co. 1 Stovall | 4,142 | 112 | 32 |
| Shirk, SE (Strawn) | Norman & Johnson 1 Routan | 3,520 | 96 | 41 |
| West Lake (Caddo) | Texaco 2 McPherson | 4,201 | 128 | 39 |




1. HOOSIER DRILLING CO., LYLE Nº 1
2. LILLIBRIDGE ET AL., CUNNINGHAM Nº 1
3. SMITH ET AL., FLIPPIN HEIRS Nº 1
4. C. H. BEAN, JOHNSON Nº 1
5. BRYSON & KEELE, WALKER Nº 1
6. BRYSON ET AL., WALL Nº 1
7. SCHAEFFER ET AL., McCORMICK Nº 1
8. WAREHAM ET AL., WRIGHT Nº 1
9. COPELAND ET AL., NEAL Nº 1
10. S. D. JARVIS, COPELAND Nº 1

# Drilling centers in northern Tennessee

**H. C. MILHOUS**
Senior Geologist
Tennessee Division of Geology

A TOTAL of 25 test wells were drilled in Tennessee during 1958. One well produced a small amount of oil and two noncommercial gas wells were discovered. Exploratory footage for the 25 tests was 20,245 ft.

### Developments

With the exception of one shallow test in Franklin County, all drilling was confined to the northern half of the Middle Tennessee geographic province. No activity was reported from the valley and ridge province of East Tennessee nor from the western part of the state.

The deepest hole drilled was the 1 Cunningham in Montgomery County with a total depth of 2,014 ft. The deepest stratigraphic test was the 1 Neal in Pickett County which penetrated approximately 70 ft. of the Knox dolomite.

The only well which made oil in commercial quantities was the 4 Reecer in Clay County. This well was abandoned after producing a few barrels from the lower Trenton and upper Stones River groups. The total depth was 700 ft.

The 1 Flippin Heirs in Macon County struck gas at 435 ft. and again at approximately 600 ft. but was still capped at the end of December and its potential is unknown. Gas was struck at less than 700 ft. in two wells at Livingston in Overton County and their production was used by the local owners. Production was from limestones of the Trenton group.

All exploration was unusually shallow with only one test reaching 2,000 ft. Total exploratory footage was a little more than 20,000 ft., giving an average of less than 1,000 ft. per hole.

### Gas Production

Production from the Jamestown gas field was estimated at 6 M.M.c.f. for the year. Production from Morgan and Scott county wells was 51,925 M.c.f. No figures are available from four gas wells in Livingston in Overton County, nor from a well at Briceville in Anderson County, but the entire production of each well was used locally.

**TABLE 1—IMPORTANT TENNESSEE WILDCATS DRILLED IN 1958**

| County | Operator | Location sec. T.-R. | Total depth (feet) | Surface formation | Deepest zone tested | Remarks |
|---|---|---|---|---|---|---|
| Dickson | Hoosier Drilling Co. | 10-3s-24e | 1,202 | Miss., M. | Ord., M. | D and A |
| Montgomery | Lillibridge et al. | 1-A 25e | 2,014 | Miss., U. | Ord., L. | Oil and Gas shows |
| Macon | Smith et al. | 15-A 43e | 650 | Ord., U. | Ord., L. | Gas—small |
| Clay | C. H. Bean | 10-A 45e | 600 | Miss., L. | Ord., M. | Gas show |
| Clay | Bryson et al. | 17-B 48e | 860 | Miss., L. | Ord., L. | D and A |
| DeKalb | Bryson et al. | 6-8s 46e | 1,100 | Miss., L. | Ord., L. | Gas show |
| Putnam | Shaeffer et al. | 17-5s 49e | 950 | Miss., L. | Ord., L. | D and A |
| Putnam | Wareham et al. | 3-4s-49e | 850 | Miss., L. | Ord., M. | D and A |
| Pickett | Copeland et al. | 18-B 52e | 1,657 | Miss., M. | Ord., L. | Oil and Gas shows |
| Scott | S. D. Jarvis | 22-B 58e | 790 | Miss., M. | Miss., L. | Oil and Gas shows |

### Oil Production

Total oil production was 6,504 bbl. Following is a breakdown by counties: Clay County, 306 bbl.; Fentress County, 293 bbl.; Morgan-Scott counties, 5,759 bbl.; and Pickett County, 146 bbl.


### Acknowledgment

The writer expresses his thanks for the assistance of W. D. Hardeman, state geologist of Tennessee, and for the cooperation of the drillers, operators, and refiners who furnished valuable information.


## Three pools open in Wyoming

THREE NEW DISCOVERIES are officially new-pool-openers in Wyoming. Two of the new strikes are in the Powder River basin, one in the Green River basin.

Sinclair Oil & Gas Co. completed 1 Svalina in C NW SW 23-50n-70w, in the Rozet area of Campbell County to give the Powder River basin a new Muddy sand Cretaceous oil pool. The well finaled on pump for 202 bbl. of 35.6°-gravity oil daily from perforations at 6,935-54 ft. Location is 5 miles northeast of Timber Creek-Minnelusa Pennsylvanian field.

The other new oil pool is Davis Oil Co.'s Brown Ranch discovery in C NE SW 2-44n-67w. It flowed 220 bbl. of oil per day from Newcastle sand Cretaceous perforations at 7,031-48 ft.

The Green River basin added an important gas discovery at Forest Oil Corp.'s 1 Arch Unit, 5 miles south of big Desert Springs field in Sweetwater County. The well was completed for 15 M.M.c.f.d. open-flow potential from Almond sand Upper Cretaceous.

**... Other news.** One of last year's big discoveries in Wyoming apparently gained an offset. Atlantic Refining Co. got 2,200 M.c.f.d. on test of Cloverly and upper Morrison at the 7 Unit, offset well to O'Brien Springs field in Carbon County. The well was an intended confirmation well to the 3 O'Brien Springs Unit which made Tensleep oil and Nugget gas on completion last year.

## Canadian wildcat hits at Lobstick

IN ALBERTA a Pan American Petroleum Corp. wildcat well has found oil production in the Lobstick area, immediately north of Pembina field.

Pan American and others 1 Lobstick flowed 601 bbl. of oil through a ¾-in. choke on a 24-hour potential production test. Gas-oil ratio was 274. Recovery was from the Cardium sand, topped at 4,474 ft. Perforation intervals were not available.

The Lobstick area discovery well was drilled to a total depth of 6,273 ft. in Mississippian lime, plugged back to 4,590 ft. The B1 is located in LSD 6, 15-50-7w5.

Pan American is operator on the well and owns 75% interest in it. Other owners, with 12½% interest each, are Pacific Petroleum Co. and Canadian Seaboard Oil Co.

## Ontario completions

| | Total | Gas | Dry | Input | Footage |
|---|---|---|---|---|---|
| January | 25 | 11 | 12 | 2 | 33,034 |
| February | 17 | 5 | 10 | 2 | 16,624 |
| March | 17 | 2 | 11 | 4 | 24,436 |
| First quarter 1959 | 59 | 18 | 33 | 8 | 74,094 |

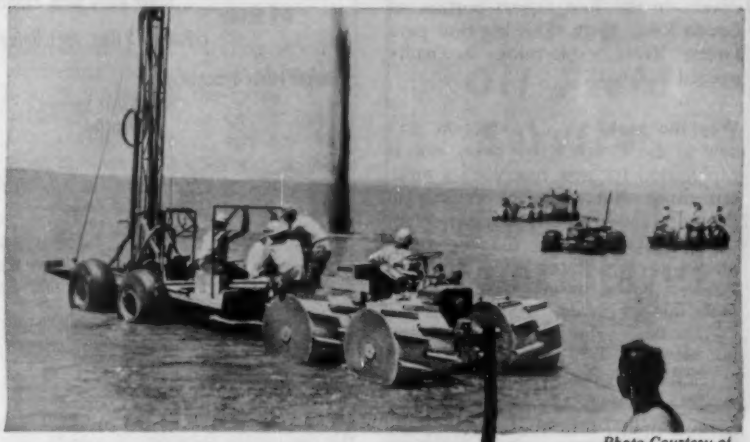



*Photo Courtesy of Shell Oil Company*

**WISCONSIN-POWERED** *Sea-Going "David Buggies" Expedite Under-Water Exploration*

Shown above is a specially designed sea-going "David Buggy" tractor working with an aquatic shot-hole rig in a shallow bay on the southwest coast of Texas. The drilling rig is mounted on a trailer fitted with aircraft tires. The "David Buggy," supplied by the Applied Research Development Co., of Houston, Texas, is powered by a 4-cyl. 30-hp. VH4D Wisconsin Heavy-Duty Air-Cooled Engine. The tractor rides on extra-wide, hollow-metal wheels... heavily cleated for traction in soft mud.

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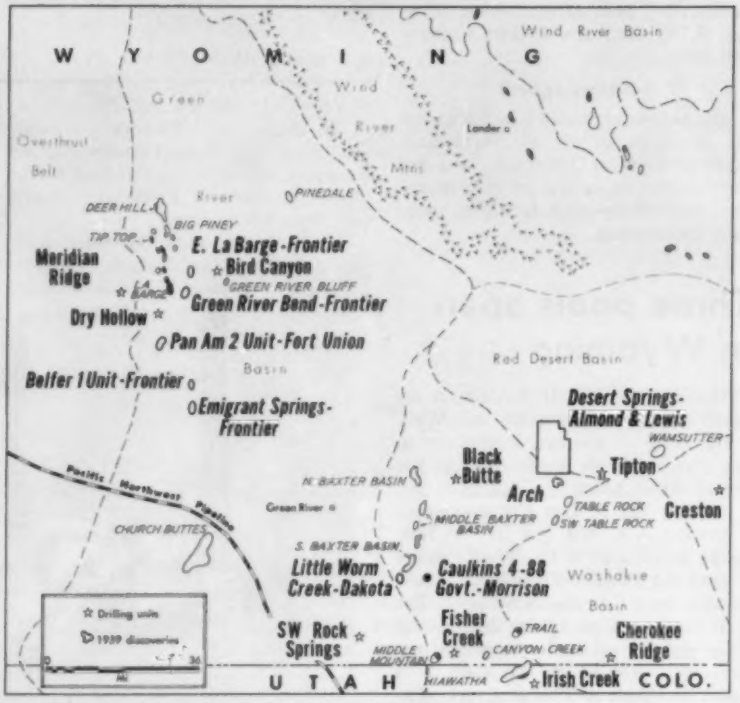
# Green River launches busy play

THE DAY OF CHALLENGE in the Green River basin is here. For a decade Rocky Mountain explorers have predicted a big push into this southwestern Wyoming basin—but the push was hardly a shove until 1958. After several years of sporadic digging here and there off the beaten production track in Sweetwater and Sublette counties, the real day of reckoning came with the opening of Desert Springs gas field—a prolific Lewis and Almond sand Upper Cretaceous discovery in the Red Desert portion of Green River basin. This big find gave Green River exploration its badly needed catalyst.




**AN ERA OF EXPLORATORY SUCCESS** in Wyoming's Green River basin has arrived. This contender for Rocky Mountain gas laurels is the region's busiest spot.

**Why the push? . . .** Production isn't new to the Green River basin, nor is exploration for new reservoirs a modern thing. But years of drilling in the vast southwestern area of Wyoming didn't turn up the big fields known to Big Horn, Wind River, or Powder River basins. Some of the most famous fields in the Rockies lie in this basin—but they are few and far between.

**. . . Baxter basin.** The gas fields on the 90-mile-long, 12-mile-wide Rocky Springs uplift, near the center of the basin, are North Baxter basin, Middle Baxter basin, and South Baxter basin. The discovery was made in 1922 at South Baxter basin. Production was sour Dakota Cretaceous gas. Later sweet Frontier gas was added. North Baxter basin opened in 1926 with Dakota gas production. Later Morrison-Jurassic and Nugget-Jurassic gas was found. Frontier gas production was found in 1938 at Middle Baxter basin.

**. . . Church Buttes.** This gas-distillate Dakota sand producer opened in 1946 at a depth of 12,500 ft.

**. . . Hiwatha.** Gas was found here in 1926 on the Colorado side of the field. Flow was from Wasatch-Tertiary rocks.

**. . . Others.** Other fields in the basin include the Big Piney, Tip Top, LaBarge, and Dry Piney areas on the west side; Pinedale field on the Pinedale structure. Recent fields include Middle Mountain, Trail, and Powder Wash.

These widely scattered Green River basin fields did little to place the basin on top-priority news lists. Exploration dwindled to almost nothing until the past couple of years. Why the sudden reentry? Pipeline outlet through the Pacific Northwest Pipeline probably is the biggest single revival factor for Green River. This line runs through the southwest corner of the province.

**Geologic sketch . . .** Green River is really a three-in-one basin. It is divided into the Red Desert, Washakie, and Green River basin. The entire basinal area, a structural and topographic basin, is bounded on the east by the Rawlins uplift, on the south by the Uinta Mountains, on the west by the rugged Overthrust Belt, and on the north and northeast by the Wind River Mountains.

The Rocky Springs uplift in the center of the basin is the biggest single structure in the Rocky Mountains. Because of its location in the center, the thickest sedimentary sections of the basin are found near the bordering uplifts. Sediments in Green River range in age from Eocene through Cambrian. It is thought that there is in excess of 30,000 ft. of sedimentary rocks near the margins of the basin. Gas and oil have been found in Cretaceous, Triassic, Jurassic, Eocene, Paleocene, and Pennsylvanian rocks.

Despite its many years of existence as an oil and gas producer, Green River remains almost untouched as a hunting ground for oil in the Rockies. The hunt appears to be at hand.

**After Desert Springs . . .** Other important gas happenings made the news after this field was opened in 1958. Wamsutter unit to the east of Desert Springs opened, there was a general awakening of gas drilling in and around the Big Piney, LaBarge, and Pinedale areas on the west side, and new additions to the Hiawatha dome area on the southern rim of the basin.

Mountain Fuel Supply Co. got its second well on the Trail Unit, adding Mesaverde Cretaceous production. Another well later last year added the third Mesaverde sand to the field's production. Mesaverde production was tapped at a Pan American Petroleum Corp. well at Middle Mountain.

**Came new units . . .** Six new fields and some 18 field-well completions in Green River basin this year, plus current drilling on 11 new units, promise that 1959 will be the basin's big year. More than 20 new units have been approved in recent months; a couple of dozen others are waiting for approval.

*—John C. McCaslin.*

...**New fields.** The six new fields are: East LaBarge, Green River Bend, a gas pool south of Dry Hollow Unit, two strikes at Emigrant Springs, and wells at Little Worm Creek.

The units are:

● **Black Butte.** Continental Oil Co. is drilling on this 41,440-acre unit east of North Baxter basin and Middle Baxter basin fields. A gas flow was recorded at 8-2 Black Butte Unit in Sweetwater County from first and second Frontier Cretaceous sands. This test is 3½ miles northwest of the first test on this unit which was dry.

● **Dry Hollow.** Continental announced location for the 24-1 Unit, first test on the proposed Dry Hollow Unit in Lincoln County. Location is 4½ miles northeast of Fort Union Tertiary production at Willow Creek field. There has been no deep drilling in this immediate area. Continental will take this well to about 7,500 ft.

● **Tipton.** Carter Oil Co. is operator on this unit. Location of the Sweetwater County area is southeast of Desert Springs. The first well, 1 Tipton, was abandoned at 9,250 ft. The block contains 27,018 acres.

● **Creston.** Carter is below 9,252 at the 1 Creston Unit, first well on this 80,532-acre unit about 19 miles southeast of Wamsutter Unit in Carbon County. Carter may run casing here on basis of gas recoveries on drill-stem test.

● **Meridian Ridge.** This far-western Green River unit lies southwest of LaBarge and Dry Piney fields. Carter is running logs at the 1 Meridian Ridge Unit with total depth at 13,991 ft.

● **Fisher Creek Unit.** This Sweetwater unit includes about 29,134 acres. It lies between Middle Mountain and Canyon Creek fields in the southern part of the basin. Carter is coring at 6,818 ft. at the 1 Fisher Creek Unit.

● **Irish Creek Unit.** Pan American Petroleum Corp. formed this 20,305-unit in Moffat County, northwestern Colorado, just south of Hiawatha. Drilling is under way with the Lance Cretaceous as objective near 7,500 ft.

● **Cherokee Ridge.** Pan American will drill on this unit 9½ miles northeast of Hiawatha. Location is staked on Block A of the two-block, 29,805-acre unit. Drilling will go to at least 9,500 ft. here. This unit has several working interest operators — Mountain Fuel Supply Co., Cities Service, Texaco, Kerr-McGee, Phillips, Tidewater, and others.

● **Southwest Rock Springs.** Phillips Petroleum Co. is drilling a tight hole 16 miles southwest of South Baxter basin in this unit. There has been little drilling within 10 miles of the remote hole. Total dept his 8,000 ft. according to reports.

● **Arch Unit.** The Arch Unit discovery well, Forest Oil Corp. 1 Arch Unit 9-G, C SW NE 9-19n-98w, Sweetwater County, was completed on open-flow potential for 15 M.M.c.f.d. from Almond sand perforations at 7,228-42 ft. This new field is 5½ miles south of Desert Springs. It is the first test on a 22,199-acre block which was unitized in February.

● **Bird Canyon Unit.** Pan American is drilling to the Fort Union and Almy sands at this Sublette County test. Location is 3 miles northwest of Green River Bluffs field, a Fort Union gas discovery area.

**Current activity . . .** Drilling on earlier established units and in existing fields is brisk throughout the basin.

Belfer Natural Gas Co. 2 Unit is a 11,000-ft. Frontier test for Emigrant Springs Unit. Several wells are drilling in East LaBarge, Hogsback, Dry Piney, Big Piney, Tip Top, Deer Hill, and Little Worm Creek.

**A rival? . . .** Wyoming's second-biggest basin has long been cited as a possible contender or rival of New Mexico's big gas-producing area, the San Juan. Green River's gas production is scattered. Much needs to be done before it joins the "gas majors." But one thing is certain—present developments, unit plans, indicated discoveries, and field-well development work make this the busiest place in Wyoming.

## Discovery well near Swan Hills completed

Official completion on the important Sarah Lake discovery well south of Swan Hills field was released by British American Oil Co., Ltd., and Pan American Petroleum Corp.

The Beaverhill Lake Middle Devonian discovery, one of the most important strikes of the year in this region, flowed 991 bbl. of oil per day from an 18-ft. interval. Flow was based on 13-hour test through 24/64-in. and 20/64-in. chokes.

## Discovery well tested in South Louisiana

Potential production of George R. Brown's new discovery well midway between West Chenier Perdue and Kings Bayou fields in southern Cameron Parish, Coastal Louisiana, is rated at 3,411 M.c.f. of gas and 76 bbl. of 50.8°-gravity condensate daily. Flow was tested through 10/64-in. choke, registering pressure of 6,740 psi. The well, 1 Nunez Unit, opens Oak Grove field.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**BRITISH COLUMBIA** gained two remote gas discoveries last week — Kotcho Lake and Petitot River—both of which are many miles northeast of previous production.

## Gas finds jump far north in B.C.

TWO remote gas discoveries in extreme northeastern British Columbia were completed last week. Gulf States Oil Co. of Canada, wholly owned subsidiary of Western Natural Gas Co., reported completion of the 1 Petitot River, 70 miles north-northeast of Fort Nelson, and the 3 Kotcho Lake, 50 miles northeast of Fort Nelson.

The Petitot River discovery is the northernmost in the province, lying just south of the Northwest Territories border. The well flowed at the rate of 6,408 M.c.f.d. from Middle Devonian zone. The 3 Kotcho Lake well flowed at the rate of 5,350 M.c.f.d. from Middle Devonian.

## Ontario well shows promise

IN CANADA, Imperial Oil reports that one of its exploratory wells in southwestern Ontario has encountered an encouraging show of oil. Imperial Harvest Submarine 1-76 Colchester South is on the shore of Lake Erie near the town of Colchester in the Windsor area. It is being drilled in partnership with Harvest Petroleums, Ltd., and Submarine Oil and Gas, Ltd. The well to date has penetrated 17 ft. of gross pay zone and is currently testing at 2,165 ft.

### Ohio extensions stretch Clinton pay

In Ohio additional completions in the Conneaut area, Ashtabula County, extending the Clinton gas play south and west were reported by the operators.

In north central Monroe township, Biller & Flanagan 1 J. A. Broomfield, Section 4, logged the sand from 3,190-95 ft. and gaged 2,582 M.c.f. natural with a rock pressure of 1,000 psi. Benedum Trees 1 Wesley Broomfield, Section 4, logged the sand from 3,121-88 ft. and gaged 189 M.c.f. natural and 1,500 M.c.f. after fracture with a rock pressure of 1,000 psi.

In northeastern Sheffield township, Belden & Blake 1 Katherine Kapelka, Section 3, logged the sand from 3,130-42 ft. and gaged 387 M.c.f. after fracture. Their 2 Doyle Snyder, Section 3, logged the sand from 3,166-70 ft. and gaged 50 M.c.f. natural and 258 M.c.f. after fracture with a rock pressure of 800 psi.

Spirited development continues as 11 strings are presently active in the area with several new locations staked.

### Gas well tested in East Kentucky

In the Letcher County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. has come up with a good gas well at 6,470 Hawk Hall located on Mill Creek. Shallow Pennsylvanian salt sand was topped at 1,683 ft. and showed gas from 1,703-18 ft. total depth. An open-flow natural potential showed 1,212 M.c.f.d. of gas with a rock pressure of 260 psi.

### San Juan development gains momentum

Occidental Petroleum Corp. announces that its seventh Four Corners area well was spudded April 23, 1959. This well, Jicarilla E 9-10, will be drilled to 6,100 ft. in 10-26n-3w, Rio Arriba County, New Mexico, as a Mesa Verde and Pictured Cliffs dual-completion well.

Contract has also been let for the drilling of Occidental's eighth well which will be spudded immediately upon completion of the Jicarilla E 9-10 well.

During 1958, Occidental successfully completed six new gas and distillate wells in the Four Corners section of New Mexico and Colorado, where the company holds leases covering approximately 28,000 acres.

The management of Occidental is of the opinion that the projected wells will be completed as producing gas and distillate wells, and plans are being made to continue the drilling program for this area with two additional wells to follow immediately upon completion of the two wells presently contracted for.

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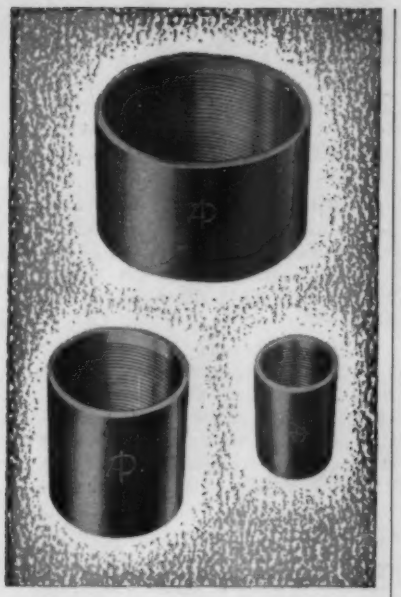

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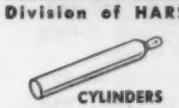

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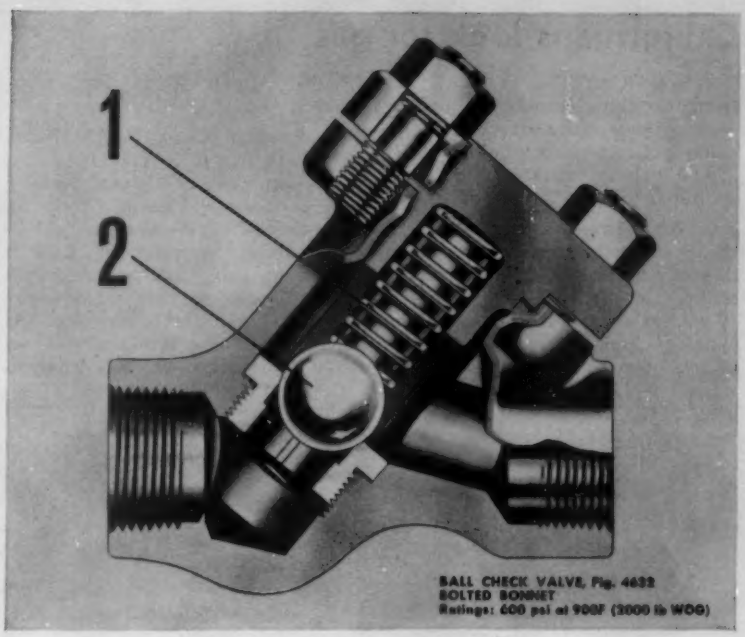


BALL CHECK VALVE, Fig. 4632
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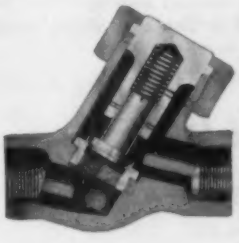

PISTON CHECK VALVE, Fig. 3578
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Ratings: 1500 psi at 850F (3600 lb WOG)

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## Californians look for gas

GAS WILDCATTING in Central and North California counties is on the upswing with operators preparing a number of interesting locations. Some of the wildcats attracting the most interest include:

... **River Island-Walnut Grove.** Len Owens and associates were preparing to join the search for additional gas reserves in this area with a 4,800-ft. wildcat slated for drilling at a site about 1¼ miles northeast from the nearest producer. Exact location is in SE SE 33 - 5n - 4e in Sacramento County.

... **Pleasant Creek - North.** Rinde Oil Co. will drill a 4,000-ft. Cretaceous test on a 2,500-acre lease 1 mile northeast of Pleasant Creek and 3 miles west of Winters gas field in Yolo County. Six years ago, Bandini Petroleum Co. made a Cretaceous gas discovery ¼ mile southeast of Rinde's wildcat. The Bandini well was credited as a new field find and initially made 3,100 M.c.f.d. from an interval at 3,575-88 ft. It was abandoned 2 years ago.

... **Suisun Bay.** G. E. Kadane & Sons were planning a 6,500-ft. outpost test on the northwest flank of this Solano County gas field. Location falls in NW SW 31-4n-1w.

... **Kirby Hills.** G. E. Kadane & Sons also staked location for a 6,500-ft. extension test 1 mile south of the nearest gas producer in this Solano County area. Drill site is in SE NE 6-3n-1e.

... **Biggs.** Royalty Service Corp., Ltd., was preparing to move in equipment to drill a 2,500-ft. wildcat located approximately 3 miles southeast of the Schohr Ranch gas field in Butte County. Humble Oil & Refining Co. has three wells producing at Schohr Ranch.

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## Tidewater slates 55-well program

SAN JOAQUIN VALLEY was getting a major boost by a 55-well program recently launched by Tidewater Oil Co. in various shallow-zone, heavy-crude fields. When under full steam, Tidewater expects to have eight rigs under contract on the project. All are programed for less than 3,000-ft. depth.

Here's what the Tidewater schedule calls for:

In the North Midway field, 8 wells; 4 at McKittrick, 1 at Los Hills, 1 at Midway-Sunset, 25 at Kern River, 13 at Coalinga, and 3 at Poso Creek.

In general, the new wells will be infills and stepouts.

As part of a similar multiwell heavy-gravity drilling program announced earlier, Tidewater completed seven wells in 3 days in mid-April in the Kern River field. Six were at depths of less than 1,000 ft. all were development wells. These wells generally come in around 20 bbl. daily of 13°-gravity crude cutting from 10 to 35% water.

## Sacramento gap closed by new gas completion

A successful gas completion by Brazos Oil & Gas Co., 1 Fong Unit, closed the gap between the two producing wells of the Walnut Grove gas field in Sacramento County.

The Brazos test is between another Brazos well and a Texas Co. well which are 2 miles apart in a northeast-southwest direction. It was completed in an interval at 4,566-73 ft. flowing 2,400 M.c.f.d. through a ¼-in. choke.

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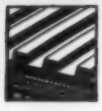

**1. Stabilizing ribbed tops** (U.S. Pat. 2548135) are exclusive with Gates. They dampen vibration, protect top of belt from damage, keep belt running smoothly over idler-equipped mud pump drives with no side whip.

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**3. Concave sidewalls** (U.S. Pat. 1813698) Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt ...longer belt life.

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## Spring dryup stirs Illinois basin

Illinois basin developments include discoveries in White and Lawrence counties, Illinois; Gibson County, Indiana, and Daviess County, Kentucky.

**Illinois . . .** New oil production is reported 4 miles southeast of Enfield in White County. The discovery is H. N. Sanders et al. 1 John L. Clark in NE SW SW 24-5s-8e. Location is 1½ miles from production. Operators are preparing to complete in Cypress sand at 2,836-48 ft. Swabbing got 15 bbl. of oil per hour.

A good oil pool is developing 5 miles south of Lawrenceville in Lawrence County. Two wells were added to the growing list of producers. William ZuHone, Jr., 3 and 4 L. T. Ackman in 6-2n-11w, got 75 bbl. of oil per day from Cypress sand and 100 bbl. from Cypress and Paint Creek sands, respectively.

**Indiana . . .** Gibson County's new discovery is Mt. Carmel Drilling Co. 1 M. Pugh, SE SE NW 19-3s-9w. The well, 6 miles east of Fort Branch, swabbed 22 bbl. of oil from Jackson sand at 1,576-1,638 ft.

**Kentucky . . .** New Paint Creek production is indicated at a Daviess County wildcat. Marhill Oil & Gas Co. and Cox Drilling Co. 2 Irene French in 6-N-29 got 1,160 ft. of clean oil in 27 hours on test at 1,532-34½ ft. This is the second strike in this area near Handyville.

## New operators try on 'Vegas wildcat

Gold Placers-Nevada & Petroleum Engineering Co. recently took over the previously abandoned 1 Government Cons. from Bonanza Oil Corp. and deepened it from 2,660 ft. to 2,897 ft. The new operator was running electric logs.

This wildcat in NE SW 31-21s-60e has been idle since last August. It is about 12 miles southwest of Las Vegas. Two other operators have staked locations for deeper tests along this Arden Anticline trend southwest of the gambling city.

## Cotton Valley opener is completed in Texas' Cass

Pan American Petroleum Corp. has completed its 1 Giraud Unit, east of the town of Linden, in southern Cass County, as a Cotton Valley discovery.

On 24-hour potential test the well flowed 281 bbl. of 49° oil through 8/64-in. choke, with gas-oil ratio of 426:1. Completion perforations are at 10,620-53 ft. Operators report no shows below the Cotton Valley but say that two other potentially productive zones above that formation will be tested before final completion.

No. 1 Giraud Unit was drilled to total depth of 12,074 ft., and plugged back to 10,815 ft. Formation markers, on elevation of 347 ft., include the Paluxy, 4,014 ft.; Glen Rose (Texas), 4,450 ft.; Pettet, 6,963 ft.; Travis Peak, 7,076 ft.; Cotton Valley shale, 9,265 ft.; Buckner, 10,705 ft.; Smackover, 11,079 ft., and salt at 11,993 ft.

Location is in the George S. Young Survey, A-1161. Pan American owns a 100% interest in the well and in an 8,300-acre block of leases surrounding it.

## Texans announce two Oklahoma finds

A Texas firm has announced two discoveries in Oklahoma—one an oil producer, the 1 Krone in Cimarron County, and the other a gas producer, the 1 Davenport in Haskell County.

The 1 Krone is located in Section 30-4n-9eCM, 21 miles east of Boise City. Production is from the middle

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Morrow sand from perforations at 4,475-80 ft. and 4,484-91 ft. The well swabbed 15 bbl. of natural oil per hour for 9 hours, or at the rate of 360 bbl. per day. Pump and storage equipment are being installed.

Ambassador owns 480 acres of leases in the section and 1,280 additional acres in the area. A west offset, Ambassador 1 Krone "A," will be started immediately.

The 1 Davenport is located in NE SW NE 33-8n-20e, 34 miles northeast of McAlester. The producing zone is Atoka sand perforated from 5,542-46 ft. and 5,550-70 ft. After treatment the well's open-flow potential was estimated at 3,600 M.c.f.d. of gas.

The discovery is on a block of approximately 35,000 gross acres acquired by purchase and farmout from Superior Oil Co. Ambassador operates the block in association with Hudson Gas & Oil Corp., Keating Drilling Co. and Republic Natural Gas Co., each company owning a 25% interest. A second well is planned immediately.

## Discovery wells

### COLORADO

Logan County: Petroleum, Inc. 1 Amen-Dermer, C SW SW 7-7n-52w. IPP 7½ BOPD, 55% water, "D" sand discovery, new field. TD 4,620 ft. "J" sand.

### KANSAS

Sumner County: Beardmore Drilling Co. 1 Trekell, NE NE NW 19-31s-1w. IPP 48 BOPD, Mississippian dolomite 3,718-27 ft., 42°. TD 3,727 ft. Opens Trekell pool in South Central Kansas basin.

Wabaunsee County: Natural Gas & Oil Corp. 1 Harrold, SW NE NE 29-14s-12e. IPP 88 BOPD, Simpson 3,124-27 ft., 23.1° TD 3,128 ft. Opens Wilmington pool in Forest City basin.

### NEBRASKA

Banner County: Brinkerhoff Drilling Co.-Pan American Petroleum Corp. 8-1 Soule, C SE NE 8-17n-56w. IPP 90 BOPD, "J" sand discovery, new field. TD 6,803 ft. Skull Creek.

### NORTHWEST NEW MEXICO

Rio Arriba County: Continental Oil Co. 20-2 Jicarilla Apache, SW SW 20-25n-4w. IPP 41 BOPD, Gallup sand discovery, new field. TD 7,020 ft. Gallup.

### NORTH DAKOTA

Bottineau County: McAlester Fuel Corp. 1-A Christenson, C NE NW 1-160n-79w. IPP 75 BOPD, 12% water, Charles discovery, new field. TD 3,480 ft. State A sand.

### OKLAHOMA

Beaver County: Petroleum, Inc. 1 State "I," SW SW NE 16-5n-27eCM. IPF 58 M.M.c.f.d., Morrow Pennsylvanian 6,440-80 ft. TD 6,950 ft. Gas discovery in northwestern Anadarko basin, Oklahoma Panhandle.

Harper County: Calvert Drilling Co. 1 Selman, SE SE NW 8-26n-20w. IPF 23 BOPD, 1,248 M.c.f.d., Morrow 6,088-6,168 ft., 1-in. tubing choke; IPF 13 BOPD, 7,536 M.c.f.d., Tonkawa 5,020-52 ft., 20/64-in. choke. TD 6,531 ft. Gas and oil discovery in Anadarko basin, northwestern Oklahoma.

Lincoln County: Allied Material Corp. 2 Kahanek, S½ S½ NW 24-12n-5e. IPP 133 BOPD, first Wilcox sand 4,715-23 ft., open hole, 23°. TD 4,723 ft. Oil discovery on Northeast Oklahoma platform.

McClain County: Weimer & Fitzgerald 1 Hester Unit, C W½ NE SW 23-6n-4w. IPF 480 BOPD, 20/64-in. choke, 40.2°, first Bromide sand 11,848-62 ft. TD 12,070 ft. Oil discovery in southeastern Anadarko basin.

### TEXAS PANHANDLE

Hansford County: Phillips Petroleum Co. 2-E Hitch, 3 miles west of Hitchland in north-central part of county. Section 10, Blk. 1, PSL Sur. IPAOF: 1,870 M.c.f.d., lower Morrow 6,933-48 ft. TD 8,500 ft. New gas field.

Lipscomb County: Wilcox Oil Co. 1 Bechthold, northwest part of county, 3 miles northeast of Booker, Sec. 27, Blk. 10, HT&C Sur. IPP 118 BOPD, 10% water, 40°, Tonkawa 6,142-70 ft. TD 6,300 ft. New oil discovery.

### WYOMING

Campbell County: Sinclair Oil & Gas Co. 1 Peter Svalina, C NW SW 23-50n-70w. IPP 202 BOPD, Muddy discovery, new field. TD 8,744 ft. Minnelusa.

Sweetwater County: Forest Oil Corp. 1 Unit-9-G, C SW NE 9-19n-98w. IPF 15 M.M.c.f.d., almond discovery, new field. TD 6,202 ft. Erickson.

Weston County: Davis Oil Co. 1 Walter Brown, C NE SE 2-44n-67w. IPF 220 BOPD, Newcastle discovery, new field. TD 7,388 ft. Morrison.

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Charles E. Webber . . . has an optimistic outlook.

# New NGAA Chief Is a "Doer"

**• Sun Oil's Charles Webber has a reputation for getting things done. He sees great future for natural gasoline.**

TO SOME people, Charles E. Webber must appear to be a rare bird. For he's a genuine enthusiast on natural gasoline.

He thinks it has a great future. Webber isn't much for telling others what should be done. He's too busy doing it himself. Having cut his teeth on "K" values, he has been applying sound engineering principles to profitable operations ever since.

The NGAA already knows that it has a "doer" in its newly elected president. It should, for he has been around its committees for years. His long suit has been the technical committee, which he has served as perennial chairman for the past 6 years.

He brings more than a slide rule to this new job, however. With broad experience in PAW and PAD and with his present job as technical advisor to Sun Oil Co. vice president J. G. (Jack) Pew, he knows his way around outside plant gates.

Charlie Webber has never stood still for very long. The son of a college professor, he followed the family from his birthplace at Stillwater, Okla., to Pittsburgh and then to Baton Rouge before he reached high school. There he remained awhile, long enough to get two degrees in chemical engineering at Louisiana State University.

**His start . . .** In the depth of the depression, he faced a fairly sour world armed with a master's thesis in sugar chemistry.

But 1934 wasn't a year for sugar. So, when Humble Oil & Refining Co. showed an interest in him, he departed forthwith for Houston with a 4-year-old Plymouth and $40.

The job was in tech service—a catch-all for testing strength of materials, porosity, viscosity, and whatever else came his way. But it was more than that. Humble's tech service and research labs were housed together in those days. So young Webber rubbed some stimulating elbows belonging to Ralph Schilthuis, Stuart Buckley, T. V. Moore, George Cannon, and a great many other technical leaders of the time.

One lucky break followed another, he says. A year's stint at Humble's London plant in East Texas pointed him in the direction of natural gasoline. And that was his bent from then on.

Returning to Houston, he was in on the original work of determining "K" values for high-pressure absorption—a prelude to design of the mammoth Katy plant. This ground-floor experience in planning the new look in field processing was a rare opportunity.

Then came a break of a different sort. He was drafted for PAW and his outlook became industry-wide. As assistant to the late James H. Pew, PAW's head of natural gas and natural gasoline, he got a thorough exposure to the industry's position in the national economy. Jim Pew also saw to it that he met not just the problems, but the oil-industry leaders who were dealing with them.

From PAW, they both went to Philadelphia as chief and assistant in Sun's gas department. Together they brought the company into the natural-gasoline picture with new plants in Starr County, Jameson, and Delhi.

Not one for beating around the bush, Webber met Miss Dorothy Bobo during the brief Houston spring of 1939. By autumn they were married. They since have become well occupied with the doings of three sons and one daughter.

**Other activities . . .** Aside from these full-time home occupations, he retains one primary outside interest.

An amateur cabinet maker, he still has all 10 fingers after furnishing their home with tables, four-posters, etc. His pride and joy is a grandfather's clock. With little or no urging, he admits it is the finest he has ever seen.

Associations have apparently found him unable to say "no." He has worked with numerous groups other than NGAA. Among his industry awards is the Hanlon Award received 2 years ago.

**His views . . .** Rather typically, he's an optimist when he talks about the business.

He thoroughly agrees with those who see a future of short supply for butane. High-octane gasoline blends and jet fuels will demand more and more from natural gasoline. Perhaps he's confusing problems with opportunities, but apparently he's never bothered to analyze the difference.

Fitzjarrald | Lyon | Stewart | Tate | McCullough | Fair

# Phillips Names Six New Vice Presidents

SIX Phillips Petroleum Co. department managers have been elected vice presidents of the company.

They are: L. E. Fitzjarrald, production; E. H. Lyon, sales; R. B. Stewart, natural gas; C. C. Tate, refining; G. W. McCullough, natural gasoline; and Harry G. Fair, supply and transportation.

Fitzjarrald, currently vice president of API's Division of Production, has been with Phillips since 1919. He has been manager of production since 1957 and was general superintendent of the production department before that time.

Lyon has been with Phillips since 1929, serving as Salt Lake City regional sales manager and sales manager before being named manager of the sales department.

Stewart has been associate manufacturing engineer, senior engineer and staff director, assistant manager of the natural gas department, and was named manager in 1956.

Tate joined Phillips' refining department in 1932 as engineer. He became assistant manager in 1944 and department manager in 1949. He spent several years in Mexico during World War II as Phillips representative during construction of Pemex refining facilities.

McCullough is a former vice president and general manager of Phillips Chemical Co. He was chairman of Phillips Petroleum's operating committee before being named manager of the natural gasoline department.

Fair joined Phillips' refining department in 1939. He was refining superintendent before being named vice chairman of the operating committee in 1953. He became operating committee chairman in 1957 before being named manager of the supply and transportation department.

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**Richard Major,** formerly chief plant engineer for the Iraqi Government Oil Refineries Administration in Baghdad, Iraq, has joined Jefferson Chemical Co. in Port Neches, Tex., as project engineer.

**S. T. (Buck) Dotson,** tool pusher for Big Chief Drilling Co. in Oklahoma City, has been promoted to drilling superintendent with Big Chief Bolivia Drilling Co. in Yacuiba, Bolivia.

**John Andrews,** president and managing director of Cabot France, S. A., since 1955, has been named assistant director of foreign operations for Godfrey L. Cabot, Inc. He will headquarter in Boston. The appointment is effective August 1.

**B. J. Terrell,** Stewart & Stevenson Services, Inc., is new chairman of the South Texas section of American Society of Mechanical Engineers. Also elected for the 1959-60 term are **Thomas Pennington,** Humble Oil & Refining Co., vice chairman; **John Beson,** McEvoy Co., secretary-treasurer; **Marvin Jones,** Cameron Iron Works, program chairman; **Ed McGhee,** The Oil and Gas Journal, publicity chairman; and **Samuel L. Collier,** Mission Manufacturing Co., membership chairman.

**Jerrold B. Hurd,** reservoir engineer in Sinclair Oil & Gas Co.'s Tulsa general production department, will move to the Denver production division June 1 as reservoir engineer. **Glenn Bankson,** reservoir engineer in Tulsa, has been transferred to Midland, Tex., in the same capacity. His appointment is effective May 15.

**Paul Robertson,** formerly Midland, Tex., district drilling engineer for Pan American Petroleum Corp., has joined Signal Drilling & Exploration, Inc., as drilling engineer and administrative assistant in Casper, Wyo. Robertson had been with Pan Am since 1956.

Citations for service have been awarded by the American Petroleum Institute to **Max Halderson,** Phillips Petroleum Co., Bartlesville, Okla.; **J. R. Hatfield,** Cities Service Petroleum, Inc., Bartlesville; **Foley F. Wright,** Sinclair Oil & Gas Co., Tulsa; and **R. B. McCloy,** Big X Drilling Co., Oklahoma City. The awards were made at the recent meeting in Amarillo, Tex., of API's Division of Production, Mid-Continent district.

**W. B. Airth,** general manager of Ajax Petroleums, Ltd., has resigned to open consulting offices in Calgary.

**A. L. Linehan,** formerly with Geophysical Services, Inc., has joined the geophysical staff of Republic Natural Gas Co. in Dallas.

**Robert N. Curry** has been named assistant superintendent of gas measurement for Texas Gas Transmission Corp. Curry was formerly supervisor of the measurement office.

**Herbert Hoover, Jr.,** a director of Monsanto Chemical Co., has been elected to the company's finance committee. Hoover, independent consulting engineer and former U. S. under secretary of state, has been on the Monsanto board since last December.

**Thomas N. Shults,** vice president of Mid-Continent Supply Co.'s export division in New York, has been elected president of the company. He succeeds **D. H. Thornbury,** who has moved up to chairman of the board and chief executive officer. **P. Z. Hilliard,** general division manager, has been promoted to vice president. Shults joined Mid-Continent in 1939 in Fort Worth. He has been in the New York export division since 1949 and became vice president in charge of the division in 1957.

# Personals

**John B. Krizer,** superintendent of refined products supply in Cities Service Oil Co.'s supply and distribution division, has been named assistant manager of the division.

**Earl S. Hargis,** senior assistant engineer for Texas Eastern Transmission Corp., has been named Seymour, Ind., division engineer. He succeeds **George Comanich,** who was recently named assistant division manager.

**Frank R. Shuman,** section chief in petrochemical processes for Sun Oil Co., has been appointed manager of process development in the research and development division. He succeeds **Earl M. Honeycutt,** who was recently named manager of manufacturing, polymers, for AviSun Corp., which is jointly owned by Sun and American Viscose Corp.

**Glenn F. Bish,** Ohio Oil Co.'s assistant manager of domestic production, has been advanced to vice president and manager of domestic production. He succeeds **Fred E. Smith,** who has retired after 45 years with the company. Smith had served the company as Los Angeles division production superintendent, general superintendent of production in the general office and assistant manager, production department, before his appointment as manager of domestic production in 1954. Bish joined Ohio in 1924. He was Grand Rapids, Mich., division manager and manager of the Tulsa production division before being named assistant domestic production manager in 1954.

BISH

**Fred A. Davies,** chairman of the board of Arabian American Oil Co. since 1952, has retired after almost 30 years of activity in Middle East oil development. Davies, geologist with Standard Oil Co. of California, became field manager of Bahrain Petroleum Co., Ltd., and California Arabian Standard Oil Co. after negotiations for an oil concession in Saudi Arabia were completed. California Arabian Standard became Arabian American in 1944. Davies has served as vice president in charge of exploration and production, executive vice president, president, and board chairman of Aramco. He was chief executive officer until last year when **Norman Hardy,** Aramco president, succeeded him. Davies is also a director of Trans-Arabian Pipe Line Co.

**Walter A. Williams,** plant superintendent in Reno, Nev., for Shell Oil Co., has been transferred to the Stockton, Calif., district as construction and maintenance supervisor. **Vernon M. Squier, Jr.,** will succeed Williams as plant superintendent in Reno.

**Thomas Herndon,** formerly director of geological projects for McCoy Associates, Tulsa, has joined Apache Oil Corp. in Tulsa as district geologist. Herndon was staff geologist for Continental Oil Co. in Casper, Wyo., before joining McCoy.

**S. Robert Blair,** formerly an assistant superintendent for Canadian Bechtel, Ltd., has joined Alberta & Southern Gas Co., Ltd., as operations engineer. Blair was most recently Bechtel senior field engineer of construction on the Imperial Oil, Ltd., refinery project in Calgary.

**Frank M. Porter,** president of Fain-Porter Drilling Corp., Oklahoma City, and president of American Petroleum Institute, has been named chairman of the board of Fain-Porter. He will be succeeded as president by **W. E. Howell,** formerly vice president of the drilling company.

**Curtis J. Little,** Lion Oil Division of Monsanto Chemical Co., has been elected president of the Albuquerque Petroleum Club. He succeeds **J. W. Loofbourrow,** Skelly Oil Co., who is newly elected vice president. Other officers are **R. H. Nordhausen,** Northwest Production Corp., secretary; and **Forest A. Daniell,** Pubco Petroleum Corp., treasurer. New directors are **Tom Carr,** Southern Union Gas Co.; **A. L. Duff, Jr.,** independent; and Little.

**William C. Imbt,** Four Corners district exploration superintendent for Pan American Petroleum Corp., has been transferred to Farmington, N. M., from Albuquerque, in a move which establishes district exploration headquarters in Farmington. Others transferring from Albuquerque to Farmington include **Robert M. Byington,** district geologist; **Ben R. Kee,** district landman; **Joseph W. Fishback,** district geophysicist; and **C. H. Jackson,** district exploration clerk. The exploration district office will be responsible for activities in western New Mexico, Arizona, southwestern Colorado, and southeastern Utah. Producing operations in the area will continue to be supervised by **L. O. Speer, Jr.,** field superintendent in Farmington since 1953.

**Paul Boyd,** formerly general manager of marketing for Wilshire Oil Co. of California, has joined Panama Refining & Petrochemical Co., Inc., as vice president. He will headquarter in Panama City, Los Angeles and New York. Several appointments have also been made for Golden Eagle Refining Co., Inc., subsidiary of Panama Refining & Petrochemical. **David Oreck,** general sales manager of Golden Eagle, has been named vice president in charge of Pacific Coast operations. **Dale H. Austin,** manager of manufacturing, has been promoted to vice president, manufacturing. **William L. Theisen,** formerly manager of export sales for Union Oil Co., has joined Golden Eagle as sales manager. Oreck, Austin, and Theisen will headquarter in Los Angeles.

BOYD

ORECK

AUSTIN

Five citations for service were presented at the Pacific Coast district meeting of API's Division of Production April 30 in Los Angeles. The awards will go to **John Orrell,** Shell Oil Co.; **Ray Mallot,** Shell Oil Co.; **Ray Elner,** Kobe, Inc.; **Harry Aggers,** Union Oil Co.; and **James T. Carriel,** Signal Oil & Gas Co.

**Howard C. Warren,** Ginther, Warren & Co., has been elected president of the Petroleum Club of Houston, succeeding **Logan Bagby,** independent. Other new officers are **Walter Sterling,** independent, first vice president; **E. Clyde McGraw,** Transcontinental Gas Pipe Line Corp., second vice president; **Raybourne Thompson,** Vinson, Elkins, Weems & Searle, secretary; **H. F. Beardmore,** Gulf Oil Corp., treasurer; and **F. W. Bell,** Brown & Root, Inc., assistant secretary-treasurer. New directors are Bell, Thompson, and **Joe T. Dickerson,** Shell Pipe Line Corp. **W. J. Gillingham,** Schlumberger Well Surveying Corp., will fill out the unexpired board term of the late R. R. McLachlen.

## Personals

**Hamilton P. Caldwell,** manager of Mobil Oil Co.'s Augusta, Kans., refinery since 1957, has been named manager of manufacturing for Mobil Oil de Venezuela. He will headquarter in Caracas. **Joe E. Penick,** manager of Mobil Oil's East Providence, R. I., refinery, will succeed Caldwell as manager of the Augusta refinery. Penick was chief process engineer at Augusta from 1952-56. **David Christison,** assistant to the manager of Mobil's Buffalo refinery, has been named manager at East Providence, succeeding Penick.

CALDWELL

**E. Oliver Hutzel,** manager of supply coordination in the supply and distribution department of Standard Oil Co. (Ohio), has been named administrative assistant to **Richard C. Sauer,** senior vice president. Hutzel has been with Sohio since 1936. He was vice president and a director of Sohio Pipe Line Co., Sohio Southern Pipelines, Inc., and Sohio Western Pipelines from 1950-52.

**W. W. Klein** has been named senior research engineer, instruments development in California Research Corp.'s geophysics development division at the La Habra, Calif., refinery. **K. H. Kilgren** has been named group supervisor, natural-gas processing, in the La Habra reservoir and producing technical service division. At the Cal Research Richmond, Calif., laboratory, **D. R. Jones** has been named group supervisor in the engine fuels division, and **K. L. Kipp** becomes senior research engineer in engine fuels.

**Dr. Joseph E. Pogue,** petroleum and natural gas adviser to Chase Manhattan Bank, has resigned as a director and petroleum consultant with Gulf Oil Corp. He will be succeeded on the Gulf board by **Frank R. Denton,** vice chairman, director, and chief executive officer of Mellon National Bank & Trust Co. Pogue joined Gulf in 1949. He was elected vice president in charge of the petroleum department for Chase Manhattan in 1936 and became petroleum adviser in 1950. He has been a member of the National Petroleum Council since 1946 and served as a special assistant to Petroleum Industry War Council during World War II.

**L. G. Stock,** Shell Oil Co. exploitation engineer in Woodward, Okla., has been named production geologist in Oklahoma City.

**R. W. Zwicky,** reservoir engineer in Shell Oil Co.'s Oklahoma City production department, has been assigned to Shell Oil Co. of Canada, Ltd.

**Glenn L. Blackledge,** manager of continuous velocity logging for Seismograph Service Corp. of Canada, has been elected vice president in charge of Canadian operations.

**David Muir,** district engineer with Empire Geophysical, Inc., has been named manager of the company's new logging station in Jackson, Miss. Muir joined Empire in 1957. He moves to Jackson from Odessa, Tex.

**P. J. Schaff,** vice president and treasurer of Cameron Crude Oil Corp., Tulsa, has been elected executive vice president. **Hugh C. Steele,** vice president, has been named manager of crude-oil purchases. In other appointments, **J. Murray Wiggins,** formerly with Shell Pipe Line Corp., has been appointed pipeline engineer. **W. B. Bauman,** formerly with Sohio Petroleum Co., has been named representative. **R. Wayne Case,** field superintendent in Taylorville, Ill., has been promoted to eastern division manager. He will continue to headquarter in Taylorville. **Johnson E. Bercher, Jr.,** has been named western division manager for Cameron in Buffalo, Okla. Bercher was assistant manager in Deep Rock Oil Corp.'s pipeline department before Deep Rock was sold to Kerr-McGee Oil Industries. He recently joined Cameron from Kermac.

**R. C. Brown,** president and a director of Hudson's Bay Oil & Gas Co., Ltd., has resigned to become vice president and a director of Continental Oil Co., parent company of Hudson's Bay. Brown will headquarter in London as foreign representative for Continental. **G. T. Pearson,** southwestern regional general manager for Continental in Fort Worth, succeeds Brown. Brown joined Conoco in 1924 in Tulsa. He had been president of Hudson's Bay since 1953. Pearson has been with Conoco since 1931. He was director of organization planning in Houston before assignment in Fort Worth 3 years ago.

BROWN

PEARSON

**Donald M. West,** formerly in charge of exploration in Libya for Mobil Oil of Canada, Ltd., has been transferred to Turkey as exploration manager for Mobil Exploration Mediterranean, Inc. He will headquarter in Ankara.

**Robert H. Martin,** secretary of the executive producing committee of Texaco Inc., has been appointed manager of Texaco's Trinidad operations in New York. Martin joined Texaco in 1942 as a geologist. He was Rocky Mountain division geologist before being transferred to the producing committee in New York last year.

## Deaths

**William D. Kleinpell,** 61, Bakersfield, Calif., consulting geologist and a director of Kern County Land Co. and Intex Oil Co., died April 21 after suffering a heart attack while on a fishing trip off Las Cruces, Mexico. A graduate of Stanford University, Kleinpell was with Union Oil Co. at one time. During the 1920's he conducted geological survey work in Mexico and South America. He opened consulting offices in 1934.

**Walker B. Comegys,** 57, partner in Seitz, Comegys & Seitz, Wichita Falls, Tex., producing company, died April 22 after a heart attack.

**Clarence Gordon Daugherty,** 40, chief geologist for Southern Minerals Corp., died April 18 in a Corpus Christi, Tex., hospital after a heart attack. Daugherty had been with Southern Minerals since 1946.

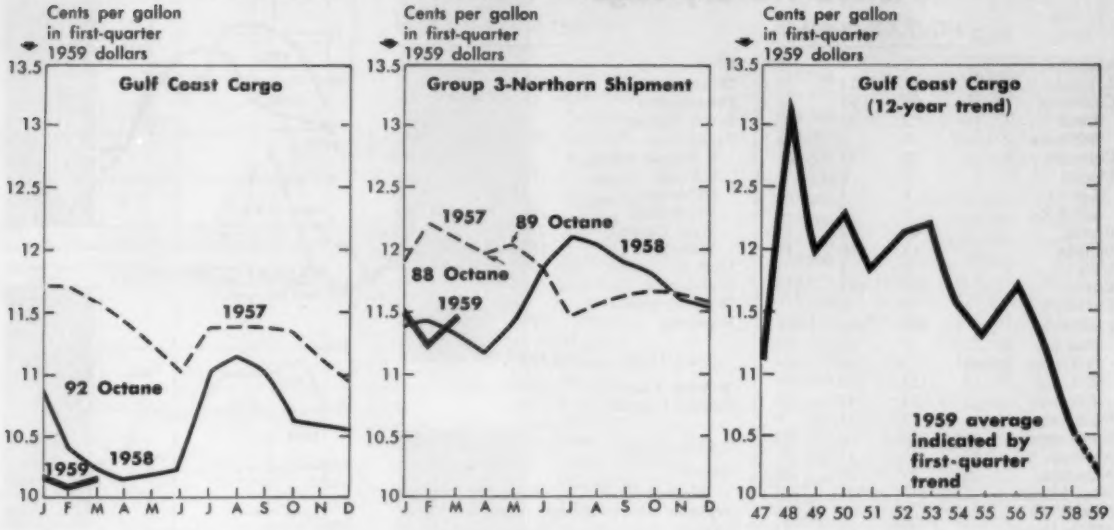
**James Eaton Morrison,** 88, pioneer Oklahoma drilling contractor and independent, died April 28 at his home in Tulsa. Morrison was active in the early days of Osage County, Oklahoma, development.

**John Charles Roe,** 86, Ochelata, Okla., retired independent operator, died April 27 in a Nowata, Okla., hospital.

**Ernest M. Moore,** 59, district superintendent for Rock Creek Oil & Gas Co. in Sulphur, Okla., died April 24 in Sulphur.

## SPOT PRICES REGULAR-GRADE GASOLINE

(Averages of Low Quotations)


Cents per gallon in first-quarter 1959 dollars
Gulf Coast Cargo
92 Octane
1957
1958
1959
Group 3-Northern Shipment
88 Octane
89 Octane
Gulf Coast Cargo (12-year trend)
1959 average indicated by first-quarter trend
J F M A M J J A S O N D
47 48 49 50 51 52 53 54 55 56 57 58 59

# Low gasoline prices shift markets

BY JOHN C. CASPER

REFINERY GASOLINE PRICES are too low. They are too low because refiners made too much gasoline.

In some areas there has been a gradual downward trend in gasoline prices for several years. These same areas have been plagued by high inventories and market shifts.

Take a look at the third chart. The line shows the trend for Gulf Coast gasoline prices since the end of World War II. Prices on the chart are averages of low quotations each year, corrected for inflation. All prices are expressed in first-quarter 1959 dollars.

The peak in 1948 resulted from a combination of rapid expansion in demand and war-restricted capacity. Starting with 1950, Gulf Coast prices have changed each year, but the trend has been downward.

The average of Gulf Coast low quotations for 1950 was 12.33 cents a gallon for cargo shipments of regular gasoline and it has been lower every year since that time.

Gasoline accounts for almost 50% of the volume output at refineries and represents well over 50% of refiners' gross income. A change of 0.25 cent a gallon in gasoline prices means more to the refiner than a shift of 75 cents a barrel for residual fuel. Low gasoline prices have been the important factor in the refinery squeeze of recent years.

## A quick look at the highlights . . .

| | LATEST WEEK | Change from WEEK AGO | | Change from YEAR AGO | |
|---|---|---|---|---|---|
| Production | 7,142,000 | UP | 12,000 | UP | 831,000 |
| Crude stocks | 251,003,000 | DOWN | 2,741,000 | DOWN | 28,287,000 |
| Completions | 878 | DOWN | 93 | UP | 20 |
| Refinery runs | 7,705,000 | DOWN | 151,000 | UP | 721,000 |
| Gasoline stocks | 211,747,000 | DOWN | 995,000 | UP | 4,600,000 |
| Kerosine stocks | 20,639,000 | UP | 793,000 | UP | 2,352,000 |
| Distillate stocks | 81,487,000 | DOWN | 31,000 | UP | 6,744,000 |
| Residual stocks | 55,490,000 | DOWN | 940,000 | DOWN | 2,110,000 |
| Four-product stocks | 369,363,000 | DOWN | 1,173,000 | UP | 11,586,000 |
| Total imports | 1,172,600 | UP | 58,000 | DOWN | 407,200 |

This gradual erosion of gasoline prices has forced the average refiner into a desperate search for ways to cut costs. Since he could not reduce equipment prices nor make reductions in labor costs, his only other important candidate for a reduction was raw material. He trimmed the price of crude.

The first two charts show that low gasoline prices have been more of a problem on the Gulf Coast than in the Mid-Continent. In the years just after World War II, cargo prices for Gulf Coast gasoline ranged about 0.5 cent higher than Group 3 prices for northern shipment.

That differential has shifted in recent years. Now, Group 3 gasoline sells for a half cent to a cent more than cargo quotations on the Gulf Coast. During the early months last year, the Group 3 price was a full cent higher for gasoline that was three octane numbers lower in quality.

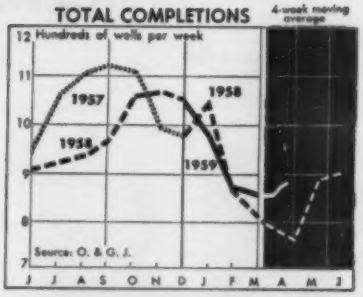
This relative price shift has changed marketing patterns. Gulf Coast gasoline can move up the river by barge and compete on a price basis in some areas normally served by Group 3 refiners.

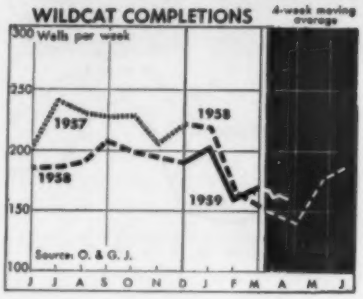
Since much of the upriver gasoline is distributed by independent marketers, private-brand stations have been showing big gains in the area just west of the Mississippi River and north of Arkansas.

## Active Rotary Rigs

| | 4-27-59 | 4-20-59 | 4-28-58 |
|---|---|---|---|
| Alabama | 7 | 7 | 5 |
| Arkansas | 15 | 14 | 16 |
| California | 95 | 95 | 70 |
| Land | 92 | 93 | (†) |
| Offshore | 3 | 2 | (†) |
| Colorado | 28 | 32 | 25 |
| Florida | 2 | 2 | 1 |
| Land | 1 | 1 | 1 |
| Offshore | 1 | 1 | 0 |
| Illinois | 41 | 42 | 33 |
| Indiana | 13 | 10 | 10 |
| Iowa | 3 | 3 | 3 |
| Kansas | 143 | 141 | 120 |
| Kentucky | 9 | 8 | 5 |
| Louisiana | 349 | 333 | 306 |
| North | 35 | 34 | 36 |
| S.-Inland waters | 152 | 147 | (†) |
| S.-Land | 118 | 110 | 219 |
| Offshore | 44 | 42 | 51 |
| Michigan | 21 | 16 | 9 |
| Mississippi | 56 | 60 | 34 |
| Montana | 22 | 17 | 21 |
| Nebraska | 29 | 25 | 20 |
| New Mexico | 113 | 115 | 123 |
| New York | 1 | 1 | 0 |
| North Dakota | 41 | 43 | 32 |
| Ohio | 2 | 0 | 0 |
| Oklahoma | 233 | 247 | 192 |
| Pennsylvania | 11 | 11 | 12 |
| South Dakota | 2 | 2 | 0 |
| Texas | 770 | 760 | 670 |
| S.-Inland waters | 6 | 7 | (‡) |
| S.-Land | 176 | 173 | 153 |
| Offshore | 1 | 1 | 2 |
| North-East | 160 | 141 | (†) |
| West Central | 272 | 276 | (†) |
| West | 155 | 162 | (†) |
| Utah | 31 | 33 | 34 |
| Washington | 0 | 0 | 1 |
| West Virginia | 6 | 4 | 4 |
| Wyoming | 65 | 60 | 45 |
| Total U. S. | **2,108** | 2,081 | 1,791 |
| Western Canada | 127 | 109 | 78 |
| Eastern Canada | 0 | 0 | 1 |
| Grand total | 2,235 | 2,190 | 1,870 |

Hughes Tool Co. †Comparisons not available due to change in method of reporting. ‡Included in South-Land.



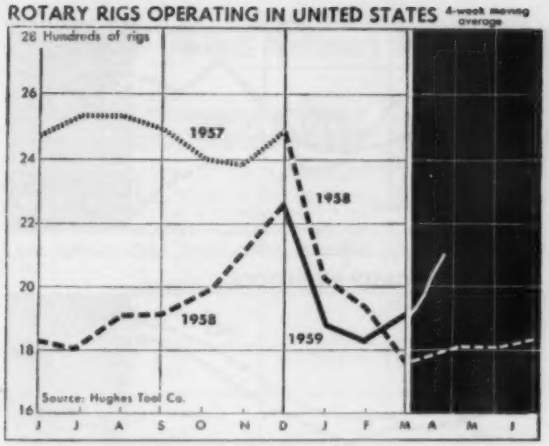




## WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 25, 1959

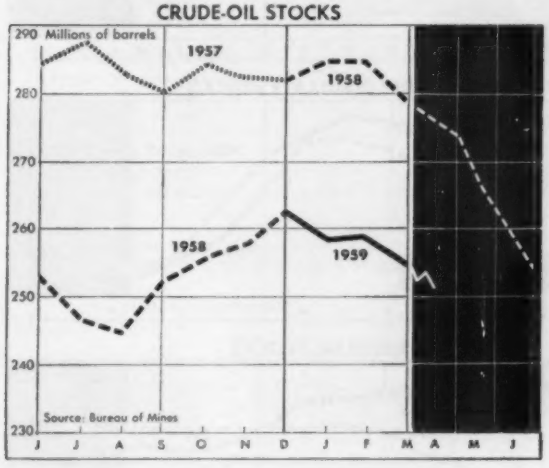
| | Total wells | | | | | | | Cum. | | Total wildcats | | | | | Cum. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Crude | Cond. | Gas | Dry | Service | Footage | 1959 | 1958 | Total | Crude | Cond. | Gas | Dry | 1959 | 1958 |
| Alabama | 1 | 1 | 0 | 0 | 0 | 0 | 11,523 | 35 | 23 | 0 | 0 | 0 | 0 | 0 | 5 | 10 |
| Arkansas | 13 | 7 | 0 | 1 | 5 | 0 | 41,561 | 275 | 209 | 1 | 0 | 0 | 0 | 1 | 48 | 46 |
| California | 22 | 18 | 0 | 1 | 2 | 1 | 73,718 | 466 | 610 | 0 | 0 | 0 | 0 | 0 | 111 | 113 |
| Colorado | 16 | 2 | 0 | 0 | 14 | 0 | 90,787 | 227 | 228 | 11 | 1 | 0 | 0 | 10 | 135 | 118 |
| Illinois | 33 | 12 | 0 | 0 | 21 | 0 | 79,018 | 635 | 575 | 9 | 1 | 0 | 0 | 8 | 108 | 121 |
| Indiana | 11 | 2 | 0 | 1 | 8 | 0 | 16,830 | 198 | 201 | 6 | 1 | 0 | 0 | 5 | 69 | 74 |
| Kansas | 76 | 29 | 0 | 3 | 43 | 1 | 283,644 | 1,255 | 1,118 | 23 | 3 | 0 | 0 | 20 | 288 | 220 |
| Kentucky | 32 | 3 | 0 | 11 | 18 | 0 | 72,770 | 503 | 276 | 1 | 0 | 0 | 0 | 1 | 51 | 34 |
| Louisiana | 67 | 29 | 10 | 2 | 26 | 0 | 533,016 | 1,092 | 1,050 | 6 | 0 | 0 | 0 | 6 | 139 | 144 |
| North | 19 | 6 | 0 | 2 | 11 | 0 | 58,331 | 381 | 359 | 3 | 0 | 0 | 0 | 3 | 61 | 54 |
| South | 43 | 20 | 10 | 0 | 13 | 0 | 431,048 | 590 | 547 | 3 | 0 | 0 | 0 | 3 | 74 | 82 |
| Offshore | 5 | 3 | 0 | 0 | 2 | 0 | 43,637 | 121 | 144 | 0 | 0 | 0 | 0 | 0 | 4 | 8 |
| Michigan | 6 | 3 | 0 | 0 | 1 | 2 | 17,713 | 162 | 108 | 0 | 0 | 0 | 0 | 0 | 47 | 40 |
| Mississippi | 13 | 3 | 1 | 0 | 9 | 0 | 119,026 | 210 | 129 | 8 | 1 | 0 | 0 | 7 | 99 | 65 |
| Montana | 2 | 2 | 0 | 0 | 0 | 0 | 11,693 | 81 | 117 | 0 | 0 | 0 | 0 | 0 | 33 | 51 |
| Nebraska | 22 | 6 | 0 | 0 | 16 | 0 | 137,616 | 232 | 201 | 12 | 0 | 0 | 0 | 12 | 108 | 95 |
| New Mexico | 30 | 18 | 0 | 4 | 8 | 0 | 123,335 | 550 | 634 | 5 | 1 | 0 | 1 | 3 | 56 | 88 |
| New York | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 97 | 175 | 0 | 0 | 0 | 0 | 0 | 8 | 13 |
| North Dakota | 6 | 4 | 0 | 0 | 2 | 0 | 33,403 | 140 | 132 | 0 | 0 | 0 | 0 | 0 | 29 | 43 |
| Ohio | 16 | 7 | 0 | 7 | 1 | 1 | 46,830 | 291 | 327 | 0 | 0 | 0 | 0 | 0 | 8 | 3 |
| Oklahoma | 112 | 60 | 2 | 6 | 41 | 3 | 404,230 | 1,847 | 2,129 | 12 | 2 | 0 | 2 | 8 | 282 | 278 |
| Pennsylvania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 163 | 32 | 0 | 0 | 0 | 0 | 0 | 3 | 6 |
| Texas | 380 | 207 | 15 | 21 | 127 | 10 | 1,562,806 | 6,014 | 5,818 | 78 | 7 | 2 | 1 | 68 | 1,149 | 1,206 |
| Dist. 1 | 21 | 12 | 0 | 0 | 9 | 0 | 39,123 | 381 | 316 | 4 | 0 | 0 | 0 | 4 | 96 | 115 |
| Dist. 2 | 24 | 5 | 3 | 4 | 12 | 0 | 133,289 | 249 | 221 | 8 | 0 | 1 | 0 | 7 | 76 | 56 |
| Dist. 3 | 18 | 5 | 4 | 0 | 9 | 0 | 153,242 | 345 | 399 | 7 | 0 | 0 | 0 | 7 | 89 | 74 |
| Dist. 4 | 31 | 8 | 3 | 5 | 15 | 0 | 170,187 | 376 | 388 | 9 | 1 | 0 | 1 | 7 | 104 | 115 |
| East | 27 | 17 | 1 | 0 | 8 | 1 | 108,385 | 351 | 410 | 5 | 0 | 0 | 0 | 5 | 76 | 116 |
| Dist. 7-B | 36 | 22 | 0 | 0 | 13 | 1 | 115,198 | 829 | 760 | 9 | 3 | 0 | 0 | 6 | 220 | 222 |
| West | 118 | 83 | 3 | 2 | 26 | 4 | 511,701 | 1,879 | 1,737 | 20 | 2 | 1 | 0 | 17 | 233 | 250 |
| Dist. 9 | 73 | 40 | 0 | 0 | 29 | 4 | 216,106 | 1,142 | 1,175 | 16 | 1 | 0 | 0 | 15 | 216 | 224 |
| Dist. 10 | 32 | 15 | 1 | 10 | 6 | 0 | 115,575 | 462 | 412 | 0 | 0 | 0 | 0 | 0 | 39 | 33 |
| Utah | 4 | 3 | 0 | 0 | 1 | 0 | 24,382 | 119 | 148 | 1 | 0 | 0 | 0 | 1 | 35 | 29 |
| West Virginia | 5 | 1 | 0 | 3 | 1 | 0 | 10,561 | 214 | 216 | 0 | 0 | 0 | 0 | 0 | 6 | 8 |
| Wyoming | 11 | 6 | 0 | 1 | 4 | 0 | 72,096 | 253 | 242 | 4 | 0 | 0 | 0 | 4 | 82 | 75 |
| Miscellaneous | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 34 | 0 | 0 | 0 | 0 | 0 | 17 | 28 |
| Total U. S. | **878** | 423 | 28 | 61 | 348 | 18 | 3,766,558 | 15,081 | 14,732 | **177** | 17 | 2 | 4 | 154 | 2,916 | 2,908 |
| Total prev. week | 971 | 459 | 31 | 105 | 356 | 20 | 4,052,922 | ..... | ..... | 183 | 16 | 3 | 7 | 157 | ..... | ..... |
| Cum. 1959 | 15,081 | 7,585 | 399 | 1,069 | 5,630 | 398 | 63,679,284 | ..... | ..... | 2,916 | 297 | 40 | 96 | 2,483 | ..... | ..... |
| Cum. 1958 | 14,732 | 7,382 | 361 | 1,084 | 5,586 | 319 | 62,836,285 | ..... | ..... | 2,908 | 270 | 46 | 100 | 2,492 | ..... | ..... |
| Western Canada | 21 | 6 | 0 | 5 | 10 | 0 | 127,027 | 763 | 783 | 9 | 0 | 0 | 2 | 7 | 292 | 297 |
| Ontario | 1 | 0 | 0 | 1 | 0 | 0 | 520 | 60 | ..... | 0 | 0 | 0 | 0 | 0 | ..... | ..... |

## PRODUCTION

### ROTARY RIGS OPERATING IN UNITED STATES




### CRUDE-OIL STOCKS




### CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

| | 4-18-59 | 4-11-59 | 4-19-58 |
|---|---|---|---|
| Pennsylvania | 2,509 | 2,513 | 2,862 |
| Other Appalachian | 1,542 | 1,475 | 1,653 |
| Illinois, Indiana, Michigan | 8,217 | 8,803 | 9,955 |
| Nebraska and North Dakota | 2,355 | 2,116 | 2,793 |
| Kansas | 9,316 | 8,844 | 10,239 |
| Oklahoma | 16,892 | 16,632 | 18,150 |
| Arkansas | 1,638 | 1,693 | 2,654 |
| Louisiana | 19,117 | 18,927 | 17,730 |
| North | 3,095 | 3,071 | 2,723 |
| South | 16,022 | 15,856 | 15,007 |
| Mississippi, Alabama, Florida | 2,331 | 2,408 | 2,399 |
| New Mexico | 8,011 | 8,520 | 8,034 |
| Texas | 107,751 | 109,270 | 124,219 |
| East Texas | 8,344 | 9,064 | 7,974 |
| West Texas | 52,494 | 52,795 | 57,415 |
| Texas Gulf | 17,397 | 17,655 | 25,211 |
| Other Texas | 29,516 | 29,756 | 33,619 |
| Wyoming | 14,232 | 13,725 | 15,926 |
| Other Rocky Mountain | 8,954 | 9,264 | 7,282 |
| California | 38,834 | 40,261 | 42,687 |
| Foreign | †9,293 | 9,403 | 12,707 |
| Total | 251,003 | 253,854 | 279,290 |

*Bureau of Mines. †Includes 4,364,000 bbl. in California.

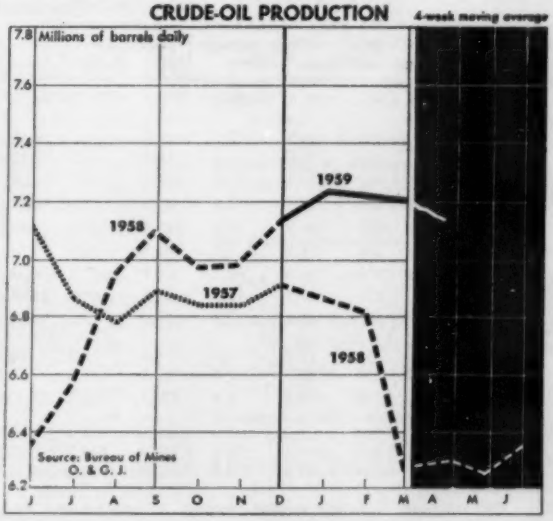
### DAILY AVERAGE PRODUCTION FOR WEEK

| | April 25, 1959 | | | Apr. 18 |
|---|---|---|---|---|
| | Crude oil | Lease condensate | Total | total |
| Alabama | 16,500 | ..... | 16,500 | 16,350 |
| Arkansas | 81,375 | 150 | 81,525 | 80,525 |
| California | 839,700 | ..... | 839,700 | 841,600 |
| Colorado | 127,000 | ..... | 127,000 | 128,000 |
| Eastern | 42,000 | ..... | 42,000 | 42,300 |
| Florida | 1,300 | ..... | 1,300 | 1,300 |
| Illinois | 223,000 | ..... | 223,000 | 222,000 |
| Indiana | 30,900 | ..... | 30,900 | 31,200 |
| Kansas | †344,690 | ..... | †344,690 | †345,100 |
| Kentucky | 65,600 | ..... | 65,600 | 65,000 |
| Louisiana | 854,625 | 110,400 | 965,025 | 965,850 |
| North | 113,350 | 4,400 | 117,750 | 114,850 |
| South | 741,275 | 106,000 | 847,275 | 851,000 |
| Michigan | 25,700 | ..... | 25,700 | 24,010 |
| Mississippi | 116,350 | 4,660 | 121,010 | 121,010 |
| Montana | 82,000 | ..... | 82,000 | 81,500 |
| Nebraska | 58,900 | ..... | 58,900 | 53,000 |
| Nevada | 100 | ..... | 100 | 100 |
| New Mexico | 289,500 | 5,100 | 294,600 | 294,600 |
| North Dakota | 38,700 | ..... | 38,700 | 38,100 |
| Oklahoma | †565,200 | ..... | †565,200 | †561,300 |
| Texas | 2,700,000 | 72,100 | 2,772,100 | 2,772,100 |
| Dist. 1 | 44,000 | 3,400 | 47,400 | 47,400 |
| Dist. 2 | 114,000 | 7,800 | 121,800 | 121,800 |
| Dist. 3 | 360,000 | 34,000 | 394,000 | 394,000 |
| Dist. 4 | 194,000 | 8,800 | 202,800 | 202,800 |
| Dist. 5 | 31,000 | 400 | 31,400 | 31,400 |
| Dist. 6 | 120,000 | 7,000 | 127,000 | 127,000 |
| East Texas field | 153,000 | ..... | 153,000 | 153,000 |
| Dist. 7-B | 145,000 | 150 | 145,010 | 145,150 |
| Dist. 7-C | 128,000 | 3,650 | 131,650 | 131,650 |
| Dist. 8 | 1,100,000 | 4,000 | 1,104,000 | 1,104,000 |
| Dist. 9 | 204,000 | 2,000 | 206,000 | 206,000 |
| Dist. 10 | 107,000 | 900 | 107,900 | 107,900 |
| Utah | 108,000 | ..... | 108,000 | 107,200 |
| Wyoming | 338,500 | ..... | 338,500 | 337,700 |
| Others | ‡110 | ..... | ‡110 | ‡110 |
| Total U. S. | 6,949,750 | 192,410 | **7,142,160** | 7,129,955 |
| Change from previous week, up | | | **12,205** | |
| Canada | †463,200 | ..... | †463,200 | †461,800 |

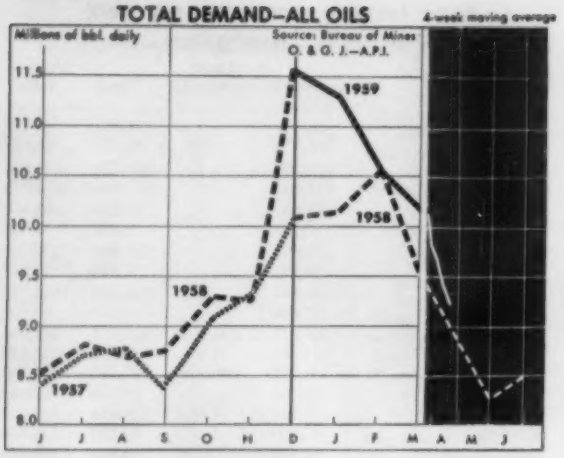
Total U. S. prod.—Jan. 1-Apr. 25 ..... 827,122,200 bbl.
Same period last year (crude plus cond.) ..... *755,219,347 bbl.

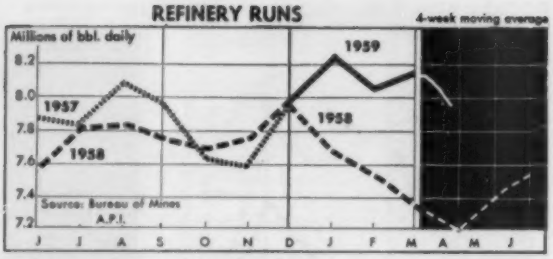
*Includes 18,903,225 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

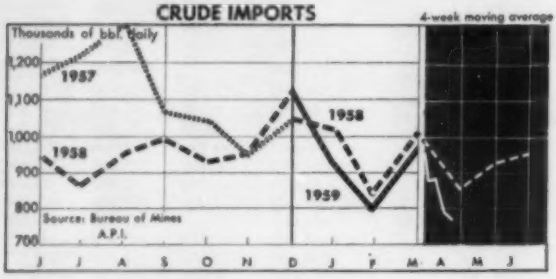
### CRUDE-OIL PRODUCTION

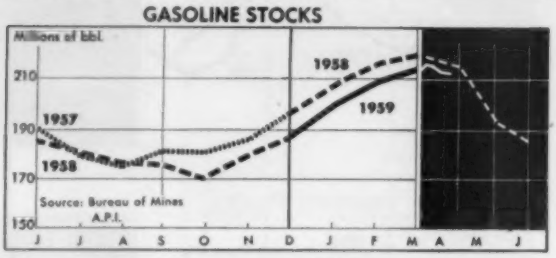


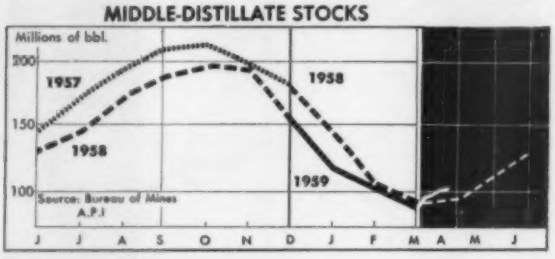
## REFINING

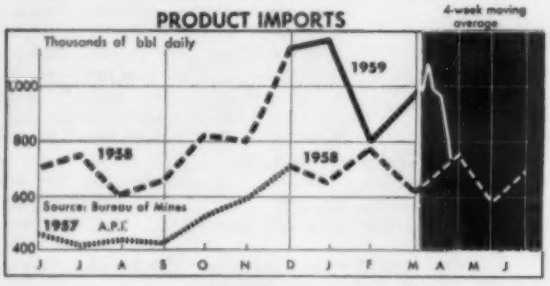


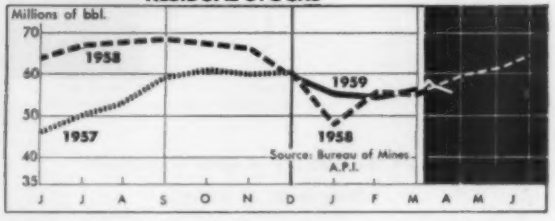




### API REFINERY REPORT—APRIL 24, 1959
(Thousands of barrels)

| District— | Daily avg. runs | Daily average production: Gaso.* | Kero. | Dist. | Resid. | Stocks‡: Gaso.† | Kero. | Dist. | Resid. | Bureau of Mines, April 1958: Daily avg. runs | Daily average production: Gaso.* | Kero. | Dist. | Resid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast | 1,065 | 491.4 | 39.3 | 236.0 | 127.0 | 49,205 | 8,222 | 28,964 | 13,018 | 1,079 | 454.3 | 35.1 | 291.3 | 162.4 |
| Appalachian: | | | | | | | | | | | | | | |
| Dist. 1 | 78 | 28.7 | 2.3 | 18.0 | 5.4 | 4,654 | 468 | 1,630 | 184 | 82 | 32.2 | 2.9 | 20.4 | 7.4 |
| Dist. 2 | 90 | 39.6 | 4.7 | 16.6 | 13.3 | 2,503 | 286 | 822 | 247 | 87 | 46.4 | 5.0 | 17.3 | 7.6 |
| Ind., Ill., Ky. | 1,340 | 700.7 | 52.4 | 289.4 | 142.7 | 39,081 | 3,710 | 11,149 | 3,382 | 1,286 | 643.4 | 59.4 | 256.3 | 142.5 |
| Minn., Wis., Dak. | 79 | 42.4 | 7.6 | 20.7 | 7.6 | 6,472 | 542 | 3,199 | 399 | 102 | 48.8 | 7.0 | 26.7 | 9.0 |
| Okla., Kans., Mo. | 677 | 396.9 | 20.9 | 165.9 | 29.4 | 20,467 | 962 | 5,908 | 917 | 637 | 345.1 | 15.7 | 143.5 | 23.5 |
| Inland Texas | 266 | 198.7 | 8.7 | 45.1 | 21.9 | 7,319 | 322 | 1,145 | 2,169 | 262 | 186.5 | 7.7 | 50.9 | 16.8 |
| Texas Gulf Coast | 1,908 | 994.0 | 69.7 | 478.9 | 167.7 | 28,340 | 2,815 | 8,815 | 4,932 | 1,673 | 829.0 | 85.6 | 405.4 | 195.0 |
| La. Gulf Coast | 633 | 347.7 | 32.0 | 148.4 | 40.9 | 11,469 | 1,797 | 4,888 | 1,342 | 585 | 333.7 | 39.8 | 140.6 | 38.0 |
| N. La. and Ark. | 97 | 48.4 | 7.1 | 13.0 | 5.7 | 5,037 | 756 | 1,773 | 159 | 114 | 52.7 | 5.6 | 24.2 | 7.1 |
| Rocky Mountain: | | | | | | | | | | | | | | |
| New Mexico | 25 | 10.6 | 0.3 | 5.0 | 2.3 | 680 | 30 | 130 | 10 | 30 | 16.6 | 0.6 | 4.5 | 3.5 |
| Other Rky. Mt. | 237 | 105.0 | 3.0 | 53.9 | 28.4 | 7,192 | 229 | 2,494 | 1,078 | 223 | 101.4 | 0.9 | 50.7 | 26.4 |
| West Coast | 1,180 | 508.6 | 9.4 | 158.1 | 322.1 | 29,328 | 500 | 10,570 | 27,653 | 1,030 | 468.4 | 4.8 | 135.9 | 307.9 |
| Apr. 24, 1959 | 7,705 | 3,912.7 | 257.4 | 1,649.0 | 914.4 | 211,747 | 20,639 | 81,487 | 55,490 | 7,190 | 3,558.5 | 270.1 | 1,567.7 | 947.1 |
| Apr. 17, 1959 | 7,856 | 3,927.3 | 276.6 | 1,833.3 | 915.7 | 212,742 | 19,846 | 81,518 | 56,430 | ..... | ..... | ..... | ..... | ..... |
| Apr. 25, 1958 | 6,984 | 3,491.4 | 298.6 | 1,563.3 | 907.9 | 207,147 | 18,287 | 74,743 | 57,600 | ..... | ..... | ..... | ..... | ..... |

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

# Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

## REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

### GASOLINE*

**Mid-Continent (Group 3):**

| | |
|---|---|
| Regular (89 octane) | 11.625-12.00 |
| Premium (99 octane) | 14.625-15.00 |

**Gulf Coast (cargoes for coastwise or export movements):**

| | |
|---|---|
| Regular (90 octane) | 10.25-10.50 |
| Regular (92 octane) | 10.50-10.75 |
| Premium (98 octane) | 11.75-12.00 |

**California (rack) (Los Angeles):**

| | |
|---|---|
| Regular (88 octane) | 12.65 |
| Premium (94 octane) | 13.65 |
| Premium (98 octane) | 14.65 |

**Caribbean area (cargoes):**

| | |
|---|---|
| Regular (87 octane) | 10.125 |
| Premium (97 octane) | 11.875 |

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

### NATURAL GASOLINE*

**Group 3:**

| | |
|---|---|
| Grade 26-70 | 4.5 |

**Breckenridge:**

| | |
|---|---|
| Grade 26-70 | 4.0 |

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

### KEROSINE AND DISTILLATE

**Mid-Continent (Group 3):**

| | |
|---|---|
| ★ Kerosine 42-44 | 10.25-10.50 |
| ★ Diesel oil (58 d.i. and above) | 10.00-10.25 |
| ★ Distillate No. 1 | 10.00-10.25 |
| ★ Distillate No. 2 | 9.25-9.50 |

**Gulf Coast (cargoes):**

| | |
|---|---|
| ★ Kerosine 41-43 | 9.50 |
| ★ Distillate No. 2 | 9.00 |

**New York Harbor (barges):**

| | |
|---|---|
| Kerosine 41-43 | 11.00 |
| Distillate No. 2 | 10.50 |
| Diesel fuel, 48-52 d.i. | 10.75 |

**Caribbean area (cargoes):**

| | |
|---|---|
| ★ Distillate No. 2 | 9.00 |

### WAX (LB.)

**Oklahoma (Group 3):**

| | |
|---|---|
| 132-135 A.m.p. (semi-refined) in tank car | 6.50 |

**New York (export):**

| | |
|---|---|
| 126-130 A.m.p. crude-scale (solid in bags or barrels) | 7.35 |

★Denotes change from previous week.

### RESIDUAL FUEL (BBL.)

**Mid-Continent (Group 3):**

| | |
|---|---|
| Residual fuel (max. 1% S) | $1.85-2.00 |

**Gulf Coast (cargoes):**

| | |
|---|---|
| Bunker C fuel | $2.00 |

**New York Harbor (barges):**

| | |
|---|---|
| Bunker C fuel | $2.37 |

**Caribbean (cargoes):**

| | |
|---|---|
| Bunker C | $2.00 |

**California (rack):**

| | |
|---|---|
| Bunker C fuel, Los Angeles | $2.15 |

### LUBRICATING OILS

**Mid-Continent (Group 3):**

| | |
|---|---|
| 150-160 bright stock, solvent refined, 0-10 pp., 95 v.i. | 23.0 |
| 200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i. | 20.5 |

**Pennsylvania Grade:**

| | |
|---|---|
| 145-155 vis. at 210, bright stock, 8 color, 25 p.t. | 22 |
| 200 vis. neutral (180° at 100°), 25 p.t. | 21 |

## CRUDE-OIL PRICES

### GRAVITY SCHEDULE

| | Signal Hill, Calif. | Okla-homa | Gulf Coast Tex.* | West Tex.† N.M. | Wyo. (sour) |
|---|---|---|---|---|---|
| 14-14.9 | $1.86 | .... | .... | .... | .... |
| 15-15.9 | 1.95 | .... | .... | .... | $1.81 |
| 16-16.9 | 2.04 | .... | .... | .... | 1.86 |
| 17-17.9 | 2.13 | .... | .... | .... | 1.91 |
| 18-18.9 | 2.23 | .... | .... | .... | 1.96 |
| 19-19.9 | 2.32 | .... | .... | .... | 2.01 |
| 20-20.9 | 2.41 | $2.49 | .... | $2.35 | 2.06 |
| 21-21.9 | 2.50 | 2.52 | .... | 2.38 | 2.11 |
| 22-22.9 | 2.60 | 2.55 | .... | 2.41 | 2.16 |
| 23-23.9 | 2.69 | 2.58 | $3.44 | 2.44 | 2.21 |
| 24-24.9 | 2.78 | 2.61 | 3.46 | 2.47 | 2.26 |
| 25-25.9 | 2.84 | 2.64 | 3.48 | 2.50 | 2.31 |
| 26-26.9 | 2.90 | 2.67 | 3.50 | 2.53 | 2.36 |
| 27-27.9 | 2.95 | 2.70 | 3.52 | 2.56 | 2.49 |
| 28-28.9 | 3.01 | 2.73 | 3.54 | 2.59 | 2.54 |
| 29-29.9 | 3.07 | 2.76 | 3.56 | 2.62 | 2.59 |
| 30-30.9 | 3.12 | 2.79 | .... | 2.65 | 2.63 |
| 31-31.9 | 3.20 | 2.82 | .... | 2.68 | 2.67 |
| 32-32.9 | 3.27 | 2.85 | .... | 2.71 | 2.71 |
| 33-33.9 | 3.34 | 2.88 | .... | 2.74 | 2.75 |
| 34-34.9 | 3.41 | 2.91 | .... | 2.77 | 2.79 |
| 35-35.9 | 3.47 | 2.94 | .... | 2.80 | 2.83 |
| 36-36.9 | 3.52 | 2.97 | .... | 2.83 | 2.87 |
| 37-37.9 | 3.56 | 2.99 | .... | 2.86 | 2.89 |
| 38-38.9 | .... | 3.01 | .... | 2.89 | 2.91 |
| 39-39.9 | .... | 3.03 | .... | 2.92 | 2.93 |
| 40-40.9 | .... | 3.05 | .... | 2.95 | 2.95 |

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 1-26-59; East of California, January 3-10, 1957; Pennsylvania Grade 4-1-59.

### FLAT PRICES

**Louisiana:**

| | |
|---|---|
| Sweet Lake | $3.00 |

**Texas:**

| | |
|---|---|
| East Texas | 3.25 |
| Conroe | 3.53 |
| Van | 3.08 |

**Pennsylvania Grade:**

| | |
|---|---|
| Bradford | 4.15 |
| Middle District | 3.97 |
| Southwest Pennsylvania | 3.70 |
| West Virginia | 3.57 |
| Buckeye Grade | 3.25 |

| | |
|---|---|
| **Illinois Basin** | **3.80** |

**Canada:**

| | |
|---|---|
| Leduc-Woodbend | 2.53 |
| Redwater (Alta.) | 2.42 |
| Smiley (Sask.) | 2.18 |
| Pembina | 2.38 |

### FOREIGN

**Venezuela:**

| | |
|---|---|
| Cumarebo, 48°-49.9°, Tucupido | 3.34 |
| San Joaquin, 41°-41.9°, Puerto La Cruz | 3.08-3.10 |
| Oficina, 35°-35.9°, Puerto La Cruz | 2.80 |
| Tia Juana medium, 26°-26.9°, Amuay* | 2.30 |
| Quiriquire, 16.0°-16.4°, Caripito | 2.10 |
| Lagunillas heavy, flat, Las Piedras* | 2.10 |
| Bachaquero, flat, 15°-16°, Las Piedras* | 1.88 |

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

**Middle East, Persian Gulf (cargoes f.o.b. lifting port):**

| | |
|---|---|
| Arabian, about 34°, Ras Tanura | $1.89 |
| Iranian, 34.0°-34.9°, Bandar Masur | 1.86 |
| Iranian, 34.0°-34.9°, Abadan | 1.81 |
| Iraq, 36.0°-36.9°, Fao | 1.82 |
| Kuwait, 31.0°-31.9°, Mina-al-Ahmadi | 1.67 |
| Qatar, about 41°, Um Said | 2.05 |

**Middle East, E. Mediterranean:**

| | |
|---|---|
| Arabian, about 35°, Sidon | 2.29 |
| Iraq, about 35°, Tripoli, Banias | 2.29 |

**Far East (cargoes, f.o.b. Lutong, Sarawak):**

| | |
|---|---|
| Seria Light, 37° | 2.57 |

### TANKER RATES PER LONG TON

(Latest reported spot fixtures)

| | |
|---|---|
| ★ Gulf-U.S.N.H., dirty (USMC—37.5%) | $1.78 |
| ★ Carib.-U.S.N.H., dirty (ATRS—72.5%) | 0.76 |
| ★ P.G.-Japan, clean (USMC—42.5%) | 5.75 |
| P.G.-U.S.N.H., dirty (USMC—70.0%) | 3.81 |

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6—St. St. & Chr. 256—1,280 sq. ft.
3—Unused U-Tube 340—1,120 sq. ft.

**Vessels & Towers**

| | |
|---|---|
| '4x57' 10 Tr. 250# | 18"x32' 15 Tr. 160# |
| 8'x75' 20 Tr. 25# | 4½'x17' 500# |
| 5'x99' 20 Tr. 135# | 12'x43' 25# |
| 2'x45' 24 Tr. | 5 Pkd. Towers 12"—24" |

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- 5—500 HP RA5 Clark Gas Engine Compressors 17"x14"
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- 6460 CFM CLARK Compressor 148 psi. 2,000 HP. Motor
- 1,500 INSTRUMENTS—VARIOUS SIZES & TYPES

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New York Office—60 East 42nd Street, New York 17, N. Y., MUrray Hill 7-5280
Tulsa Office—306 Thompson Bldg., Tulsa 3, Okla. Diamond 3-4890

**SALES AGENTS FOR LIPSETT, INC.**

## FOR SALE EQUIPMENT

FOR SALE—8 Clark gas engine compressors, size RA-3, RA-6, RA-4, RA-3. Box L-305, The Oil and Gas Journal, Tulsa, Oklahoma.

3 FRANKS Well Servicing Units, 2 Double Drum, 1 Single Drum, entire business, phone 2736 or 166. 322 East Bdwy., Seminole, Oklahoma.

60 G-R TWIN SECTION and Brown Fintube Heat Exchangers to 600# WP. Kinslow Equipment Company, P. O. Box 5283, Tulsa, Oklahoma. WEbster 9-6896.

PORTABLE MIDWESTERN Reflection-Refraction 12 channel Seismograph complete. Ruska Scout Magnetometer. Gish-Rooney-Wenner type 4 point Geophysical Instrument Co. earth resistivity apparatus. No reasonable offer refused. Fisher Research Laboratory, Inc. 1975 University Avenue, Palo Alto, California.

FIVE NEW Byron-Jackson & Bingham multi-stage Pipe Line Pumps 350-400 GPM @ 1130'-1450' head; Nine used Clark Bros. Gas Compressor cylinders 4½"x14" Type VSF, 3,000 psi. WP; 37 Shell & Tube Heat Exchangers, all floating head, 200 to 2,000 sq. ft. area. Send for list. KINSLOW EQUIPMENT COMPANY, P. O. Box 5283, Tulsa 12, Oklahoma.

PLANT LIQUIDATION—Gasoline Plant at Benavides, Texas, 2,000 bbl. Crude Topping unit; Depropanizer & Debutanizer complete; misc. columns; vessels; pumps; heat exchangers; gas compressors; Oil heaters; Oil & Gas Separators; atmospheric sections; Propane & Butane Storage Tanks; other tanks 250 to 3,000 bbl. capacities; steel buildings. Send for list. KINSLOW EQUIPMENT COMPANY, P. O. Box 5283, Tulsa 12, Oklahoma.

USED PIPE AND USED TANKS—For Sale. Rogers & Wright, Incorporated, 216 West Second Street, Tulsa, Oklahoma; 710 Peoples Building, Charleston, West Virginia.

FOR SALE—2 Bucyrus-Erie 28L Spudders, late models, with or without tools, 50 tons to pick from. Jack & H. P. Read, P. O. Box 205, Phone 385, Scottsville, Ky.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

CLIMAX BLUESTREAK ENGINE — 225 H.P., Butane, 8 cylinder, clutch, canopy, skid-mounted, good condition. Sacrifice $2,250. General Holding Corp., 163 S. Fairfax, suite 7, Los Angeles 36, Calif.

EMSCO 300 Rotary Drilling Rig, 6 ft. sub structure, 127 ft. Lee C. Moore Derrick, pulls triples, two 1335 Buda Engines, 7¼"x12" Gardner-Denver Mud pump, a good 5,500 foot rig, fast on trips, complete, ready to go. Price: $37,500.00. Address: 4916 N. Pate Street, Oklahoma City, Oklahoma.

500,000 FT. 10¾" O.D. 35-40# No. 1 grade, machine cleaned, plain end, random lengths, straight, coated, price $1.65 a ft. f.o.b. cars Columbus, Ohio. Central Ohio Pipe Co. Phone 3-3377—P. O. Box 323. Decatur, Indiana.

**9 RIGS FOR SALE**
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2—5,000' Emsco's • 1—5,000' Brewster.
1—6,500' Emsco • 1—7,500' Emsco
1—8,000' Unit • 2—8,500' Bethlehem's.
1—8,500 Ideco.
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**MOORE DRILLING CO. LTD.,**
**502 Empire Bldg., Ph. AMherst 3-6930,**
**Calgary, Alta.**

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**Complete Rigs**
2,000' to 6,500' Drilling
Terms or Rental Contract.
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**804 Petroleum Building**
**Wichita 2, Kansas**
**Telephone: AM 5-2611**

**Oil Well Fracture & Cementing Truck With Pumps, Etc.**
**Sacrifice, Private Party.**
**Dealers welcome.**
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**1531 Kenneth Road, Glendale, Calif.**
**CH 5-5917**

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## NEW IDECO RIGS AND MACHINERY
### RECONDITIONED AND USED MACHINERY
### USED RIGS

1—Brewster N-4 Torque Converter Rig Complete, powered by Waukesha 6WAK Engine. With 93' high Lee C. Moore Mast with 6' Substructure, Gardner-Denver 7¼"x12" Pump powered by LeRoi V-12 Engine, Blowout Preventer, Vibrating Shale Shaker, Brewster Block, Swivel and Rotary, Full Complement of Accessories and 6,000' of Excellent 4" O.D. Grade E Drill Pipe. Located at our Oklahoma City Yard.

1—133' high Ideco Full-View Mast with Substructure and Accessories. Located at our Odessa, Texas, Yard.

LUCEY PRODUCTS CORPORATION

**DALLAS - ODESSA, TEXAS • OKLAHOMA CITY - WOODWARD, OKLA.**

RIGS FOR SALE: U-15 Drawworks, Waukesha Motors, 127' Moore Mast, 7' Substructure, 14" Oilwell Pump, 6,500' Grade E Drill Pipe, Mud Tanks. U-15 Drawworks, Waukesha Motors, 131' Moore Mast, 11' Substructure, 16" Gardner-Denver Pump, Steel Mud Pits, 8,000' Grade E Drill Pipe. Located near Liberal, Kansas, now running, both rigs complete, inventory on request. CEntral 2-6318, Oklahoma City.

**LET YOUR ENGINES LIVE LONGER**
The patented SIMPLEX OIL TESTING KIT, developed for the Government—now commercially available. A new preventive maintenance tool that allows anyone to quickly, simply and accurately determine damaging contaminants in engine lube oils. Tells what minor engine adjustments can be made today—to eliminate tomorrow's major overhaul. Write to **LENGOR, Inc., P. O. Box 126, Annapolis, Maryland.**

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## Parkersburg Spudder
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38 ft. mast. Rated at 2,500 ft. All steel welded construction. All new bearings and sheaves in crown block. New spudder gear and drive chain. Frick-Reed double clutch. 3,000 ft. ⅞-in. cable, and 3,100 ft. sand line. Moves over highway without permit. Handles range 2 pipe.

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Inspect it while in Tulsa for I.P.E.

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## HELP WANTED

FOREIGN EMPLOYMENT: Lists about 40 U. S. oil companies, 30 drilling contractors, operating abroad, showing where apply foreign jobs. $5 cash. OIML Co., Box 2003, Tulsa, Okla.

## Production Engineers

Well known expanding major oil company has openings in district offices of domestic oil and gas producing operation. Minimum of three years production experience required; water flood experience desirable. Response should include salary expected and complete resume of education and experience. Our employees have been informed of this advertisement.

**Box L-309,**
**The Oil and Gas Journal,**
**Tulsa, Oklahoma.**

## HELP WANTED

GEOPHYSICIST under 32 with minimum five years experience, some of which has been in Louisiana. Opening in Dallas, Texas, with aggressive independent oil company. Send resume, small photo and other pertinent information to Box L-301, The Oil and Gas Journal, Tulsa, Oklahoma.

PROJECTS ENGINEER: Expanding oilfield construction and pipeline company has immediate opening for Graduate Engineer, 24 to 30 years of age, qualified to estimate and supervise pipeline and gas compressor installation work. Liberal benefits. Salary commensurate with experience and ability. In reply give summary of education and experience, salary expected and date available. Write to: Flint, 705 Midland Bank Building, Billings, Montana.

## SALES REPRESENTATIVES WANTED

Experienced Sales Representatives wanted to sell equipment for metering crude oil, water, and gas and for testing oil and gas wells. Remuneration on Commission Basis. Following Territories currently open: (1) Southern Louisiana, (2) Mississippi and Alabama, (3) North Texas, and (4) California. These Territories available on exclusive protected contract basis to qualified experienced men. Equipment includes Vol-U-Meters, Metering Separators, Metering Treaters, Well Testers and related equipment. Please give details concerning Sales Experience, Lines Handled, Area Covered, Personal Data, and five References in first reply to:

OIL METERING and Processing EQUIPMENT CORP.
MELROSE 5-1226 • 4843 YALE STREET
HOUSTON 18, TEXAS

Some of our Equipment will be displayed at the I.P.E. Tulsa, Oklahoma, May 14-23, at East Door of Hall of Science Building. You are invited to see our Equipment There.

## HELP WANTED

FOREIGN - DOMESTIC EMPLOYMENT. Oil, Chemical, Industrial. Write for details without obligation. Accredited Personnel Services, P. O. Box 6006, New Orleans 14, La.

EXPERIENCED GEOLOGIST with five to ten years experience Louisiana-Texas areas. Age under 33. Location Dallas, Texas. Send detailed resume, transcript of grades, snapshot and salary desired to Box L-300, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL INDUSTRY EMPLOYMENT SERVICE, 405 Tuloma Bldg., Tulsa, Okla. GI 7-5974. We prefer work with graduate, experienced engineers, toolpushers.

WANTED: Petroleum engineers and drilling personnel for appointments overseas. If interested, contact Mr. Looper, Overseas Craftsman's Association, 426 South Spring Street, Los Angeles.

DESIGN ENGINEER—Small manufacturer of lease process equipment has opening for graduate engineer with minimum three years experience in design and fabrication of tank company equipment. Prefer man under thirty. Must be aggressive, possess unusual initiative—resume of experience and education to Box L-299, The Oil and Gas Journal, Tulsa 1, Oklahoma.

WANTED: Superintendent for Gulf Coast territory, with experience in operating, workover, and drilling. Substantial independent operator. State education, experience, approximate salary. Box L-307, The Oil and Gas Journal, Tulsa, Oklahoma.

### WANTED
### PETROLEUM ENGINEER

Independent Oil Company has opening for graduate pertoleum engineer with three to five years' experience in field work and reservoir and evaluation engineering. Location—Calgary, Alberta. In reply please give full particulars on education, experience, personal data—including a recent picture, references, and salary expected. All replies will be confidential. Our employees are aware of this ad.

**BOX L-291,**
**THE OIL AND GAS JOURNAL,**
**TULSA, OKLAHOMA.**

### Property Evaluation Engineer

Petroleum Engineer with 6 to 8 years experience in property evaluation and appraisal, producing and non-producing properties. Will also do general Reservoir Engineering. Staff position, large independent, Gulf Coast location. Salary open. Inquiries confidential.

**Write giving detailed information to**

**Box L-271,**
**The Oil and Gas Journal,**
**Tulsa, Oklahoma.**

### PETROLEUM REFINERY CHEMICAL ENGINEERS
### APPLIED MATHEMATICIANS

For expanding technical activity engaged in consulting-type service to petroleum refiners. Positions involve a wide variety of projects in sales, research, refining, and company management. Excellent opportunities for persons with either or both of the following backgrounds:

A few years of refining industry experience in process engineering or economic analysis.

Experience in applications of linear programming, statistics, or electronic computing.

These positions afford professional contact with refining and process companies throughout the petroleum industry, and provide opportunity for using initiative and individual expression to increase responsibility. Detroit suburban location.

**Send Resume To:**
**PERSONNEL MANAGER**
**ETHYL CORPORATION**
**1600 W. 8 Mile Road**
**FERNDALE 20, MICHIGAN**

## HELP WANTED

### Petroleum Process Engineers

Opportunity for experienced Ch.E. or Refining Engineers who can qualify for position of CHIEF PROCESS ENGINEER and SR. PROCESS ENGINEER at a modern refinery in Duncan, Oklahoma. These are outstanding career positions for young men with a substantial background in Petroleum Refining. Send complete resume, including salary requirements, to

**SUPERVISOR OF EMPLOYMENT,**
**D-X Sunray Oil Company,**
**P. O. Box 2039, Tulsa, Oklahoma.**
**All replies confidential.**

### OPERATORS TO SUPERVISE

operation and maintenance and train customers' employees in Urea Plant in Korea. Assignment for 18 months or more. Require experience in Air Separation, Partial Oxidation, Shift Converters, Ammonia Synthesis or Urea Synthesis. Also desire Technical Personnel, Laboratory Supervisors and Powerhouse Operators. All inquiries kept confidential. Consideration based on submission of complete chronological experience. Resumes to:

**McGraw-Hydrocarbon (S&T)**
**161 East 42nd Street**
**New York, N. Y.**

## SITUATION WANTED

PET. ENGR. Refinery Major, 38. Experience Gas Processing & Sales. Desires responsible position. E. F. Jernigan, 3414 East 39 Street, Tulsa, Okla.

PETROLEUM ENGINEER: Age 39, 10 years' experience, reservoir engineering, drilling, production with major company. Desires superintendent or engineering position with aggressive independent. Box L-293, The Oil and Gas Journal, Tulsa, Oklahoma.

CENTRAL ILLINOIS—Need experienced independent oil promoter-producer to form partnership arrangement with geologist. Prospects favorable, have complete data. Box L-312, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, 31, seven years experience. Four in Rocky Mountains. Willing to move anywhere, domestic or foreign. Excellent recommendations. Box L-314, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 34, married, with 9 years diversified experience in secondary recovery. Desires responsible position with aggressive independent operator in engineering or management. Location Mid-Continent or Southwest areas. References on application. Box L-310, The Oil and Gas Journal, Tulsa, Oklahoma.

## REPORTS-MAPS

### Interested In Sahara?

Geological chapter and verse on basins in France, North Africa, Africa south of Sahara?

Analysis of exploration, drilling and production in French Community in 1958? Development programs for 1959?

In-extenso text of the new French oil code relating to Sahara? Accurate field-maps?

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Thrown in: full-color 51⅜ x 35⅜-in. wall map showing geographical location of concessions and applications in North Africa. Full-color 20⅝ x 21⅜-in. wall-map of France.

Ask for free copy of "Petroleum Mirror," the monthly wellhead for red-hot, on the spot information on exploration activities in the French Community.

**Petroleum Mirror,**
**50 Stanislas-Torrents St., Marseille, France**

## PRODUCTION FOR SALE

APPROXIMATELY 2,000 barrels monthly settled production—Kansas—11 wells—12 additional locations. Particulars, Robert C. Burns, 702 Commerce Building, Kansas City, Missouri.

## LEASE AND DRILLING BLOCKS

KENTUCKY BOOM AREA. Desire contact with large contractor. 400 acres Russell County. Producing wells in 1920's. Contact Lawrence Coffey, Jamestown, Ky., telephone (Russell Springs) UNion 6-4268.

OIL AND GAS LEASE for sale on my 1,310 acre tract in Sections 28, 29 & 30, Township 4N and Range 17 East of the Indian base Meridian, Pittsburg County, Oklahoma. $2 per acre bonus and $1 per acre rental. Manuel Rudy, 3818 Canal Street, Houston 3, Texas.

CAPITAL AVAILABLE to operators with capped-in gas property, for gathering lines, or will acquire oil or gas properties. Kiser Oil Co., Box 667, Olive Hill, Ky.

TAX MONEY AVAILABLE for drilling of proven or semiproven property. Box L-308, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL LEASE five hundred acre block in center of Arkansas Valley region. Surrounded by Major Oil Leases. Big gas well offsetting on southeast section. Best offer over ten dollars acre accepted. Ten year lease, dollar acre rental. R. S. Littlefield, Spiro, Okla.

KENTUCKY—Cumberland County Next—Kentucky shallow drilling boom area, 1000 acres near old wells drilled 1829-1905. A sure oil field. Price $7.50 per acre ⅛ over ride. Come or phone—W. V. Cravens, Russell Springs, Kentucky.

7,000 ACRE Drilling Block For Sale. Southern Nevada. Near new Shell drilling operation. General Holding Corp., 163 S. Fairfax, suite 7, Los Angeles 36, Calif.

ALASKA: Lease & Drilling Blocks in Copper River and Susitna Basins. Up to 100,000 Acres. Will file for you on Federal Lands. Alaska Oil & Leasing Service, 934—6th Avenue, Anchorage, Alaska, Phone 3-2935.

WANTED: Offset shallow drilling deals in the Illinois, Indiana, and Kentucky basin. Can drill one well per month. Send all replies to Box L-311, The Oil and Gas Journal, Tulsa, Oklahoma.

I WILL BUY your producing interest or drill your shallow prospect. U. S. Andersen, 8350 Santa Monica Blvd., Los Angeles 46, Calif.

**OVER 2,000 ACRES OIL & GAS RIGHTS** in Southwestern Ontario. Gravitymeter Survey shows two structures. Excellent Prospects.

**Box L-313, The Oil and Gas Journal,**
**Tulsa, Oklahoma.**

## BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

### Venezuelan Contact

Do you need Venezuelan Contacts, Representations, Surveys or "local know-how," if so write

**TEN EYCK HULL**

**Edificio Galipan** — **Caracas, Venezuela**
**Cable: CALLHULL** — **Telephone: 33-31-95**

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Do You Need:

A Denver Mailing Address and Telephone No.
An office to use when in town with Secretarial services.
Mimeographing.
Notary Services.
Typing Of All Oil Reports.
Reservations.

Please Contact

**Oil Industries Correspondence Center**
**911 Midland Savings Bldg.**
**Denver 2, Colorado.**
**Attn.: MRS. JOYCE B. ROBINSON**

### TECHNICAL LITERATURE

PRESSURE EXTENSION TABLES for orifice meter measurement: 2000-6000# in 20# increments versus ½" increments to 20½", then 1" increments to 100" (24,000 extensions). Computed on I.B.M. equipment. Prepublication offer $17.50. Durland B. Eakin, 1310 Devon Drive, Corpus Christi, Texas.

### PRODUCTION WANTED

WANTED: Oil properties. 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

### BUSINESS OPPORTUNITIES

12½% INTEREST in completed gas well, Kay County, Oklahoma. $25,000. General Holding Corp., 163 Fairfax, suite 7, Los Angeles 36, Calif.

FOR SALE—Machine and welding shop, located in eastern Venezuela in the heart of the oil fields. This is a large shop and will require approximately $800,000 to purchase. If interested, write to: Petroleum Machine Works, C.A. Apartado No. 177, EL TIGRE, ESTADO ANZOATEGUI, VENEZUELA, SOUTH AMERICA.

FINANCIAL CONTACT. If your proposition justifies a firm underwriting, please submit details for consideration. No shopping. Confidential. Have associate with underwriting connection. Consultant, 817—51st. St., Brooklyn 20, N. Y.

### REAL ESTATE

FOR OIL SHOW: Will rent lovely 3-bedroom 2-bath home for oil show, maid service, four blocks from Exposition grounds. Write Box 3688, Tulsa, or Call WE 6-9211 evenings or weekends.

### SUB LEASE

**DESIRABLE OFFICE SPACE**

3,000 Sq. Ft. or Part on One Floor National Bank of Tulsa Building. Contact K. C. Fish, 2001 National Bank of Tulsa Bldg., Telephone LU 4-5996 or H. E. Canada, P. O. Box 2159, Dallas 21, Texas, Telephone RI 7-7011.

### LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 440.09 acres of land in three parcels within the known geologic structures of Hugoton, Greenwood and East Adams Ranch Fields in Finney, Morton and Meade Counties, Kansas, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before June 10, 1959, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Adjudication Unit.

### LEGAL

SEALED BIDS will be received until 2:00 P. M. Mountain Standard Time, May 19, 1959, and opened at that time in the Office of the Uintah and Ouray Indian Agency, Fort Duchesne, Utah, for the leasing of 10,954.46 acres of Tribal Indian lands, located in Township 1 North, Ranges 1, 2, 3, 4 and 5 West, Duchesne County, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Uintah and Ouray Indian Agency, at Fort Duchesne, Utah.

### LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 241.90 acres of land described as Lots 3, 4, 5, 6, 7, 8, NW¼SW¼ Sec. 34, T. 18 N., R. 15 W., Louisiana Meridian, Caddo Parish, Louisiana, within the known geologic structure, undefined, of Greenwood-Waskom Field will be offered for oil and gas leasing in one parcel through competitive bidding to the qualified bidder of the highest cash amount per acre at 1 P. M., E.S.T., May 20, 1959, when bids will be opened. Bids may not be modified or withdrawn unless the modifications or withdrawals are received prior to the time fixed for opening of the bids. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Eastern States Land Office, Washington 25, D. C. H. K. Scholl, Manager, Eastern States Land Office, Washington 25, D. C.

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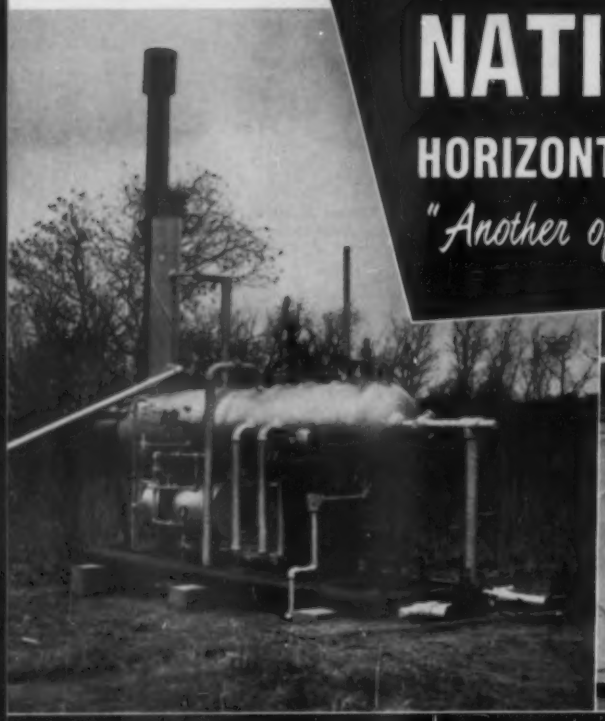
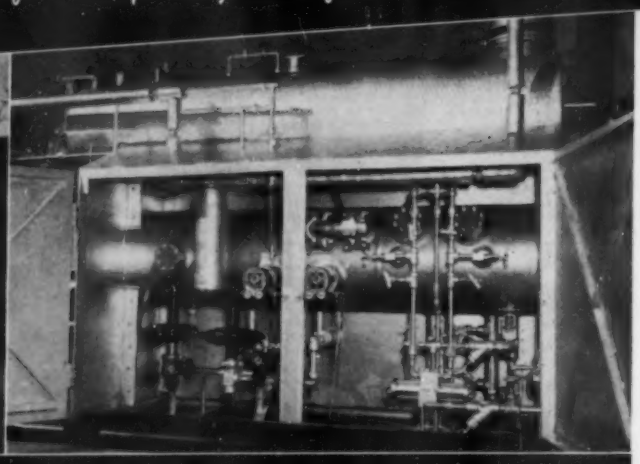


UNIT WITH INLET SCRUBBER ON STREAM NEAR OKLAHOMA CITY



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**FEATURING:**

- National Vari-Flo glycol trays
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National Vari-Flo horizontal glycol trays are more efficient than conventional trays now in use due to elimination of dead spots and non-channeling of glycol.

The glycol pump splits the flow into two equal streams of freshly concentrated glycol into the two horizontal trays.

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Split flow contactor trays are "Another of Many Originals by National."

Dewpoint depressions have been obtained as high as 85° and 90° using New Hi-Dry Liquid Desiccant and depressions better than 75° using other glycols.

Depressions of 95° to 110° on four tray units using New Hi-Dry Liquid Desiccant.

Standard units in capacities of 2, 4, 6, 10, 15, 20, 30 and 40 MMCFD. Special sizes made to order.

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DIVISION OF THE DOW CHEMICAL COMPANY

*Hughes Building, International Petroleum Exposition, Tulsa, Oklahoma*
Block 106, Skelly Drive

# EVOLUTION OF THE ROCK BIT TO BE TOLD IN HUGHES EXHIBIT

Fifty years of rock bit history, from the industry's very first rock bit to the very latest, will be traced in models and pictures at the Hughes exhibit at the International Petroleum Exposition, Tulsa, May 14-23.

The exhibit will feature the Hughes 1909 bit, which introduced the basic cutting principle incorporated in all present day cone-type bits; the *first* reaming cone bit; the Simplex bit that introduced self-cleaning cones — a major advance in cutting structures; the Unit bit that opened the door to modern bit designing; and the first of the Tri-Cone bits that introduced the era of "tailor-made" bits, designed to drill specific formations. Also shown will be *today's bits* that reflect a half century of research and experience gained in making millions of bits that have drilled over two billion feet of hole in fields throughout the world.

On display, too, will be *the latest* developments in tool joints.

Hughes officials, engineers and sales personnel, familiar with drilling problems in all parts of the world, will be on hand to greet exhibit visitors. We shall look forward to seeing you in Tulsa.

**HUGHES TOOL COMPANY**

50TH ANNIVERSARY YEAR 1909 – 1959